

Aviation Week & Space Technology

October 29, 1962

SPECIAL REPORT:

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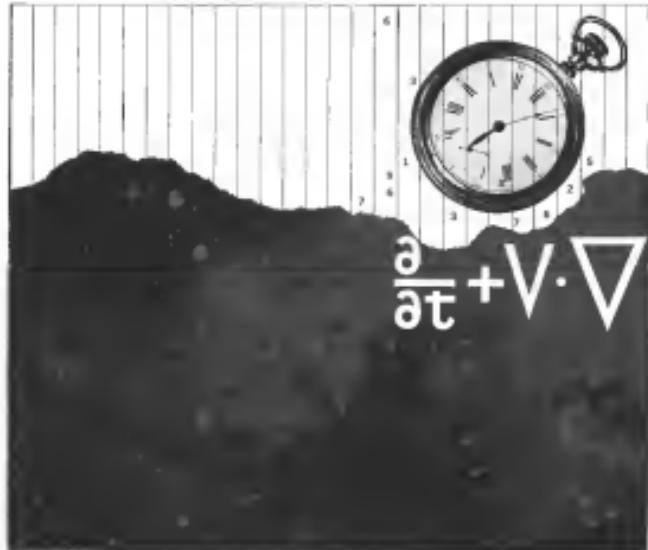
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AEROSPACE CALENDAR

Nov. 8-9-Symposium on Protection Against Radiation Hazards in Space, Cambridge, Mass. Contact Space Radiation Laboratory, NASA, Marshall Space Flight Center, American Nuclear Society.

Nov. 8-9-Nazaspace Electronics Research and Engineering Meeting, Institute of Radio Engineers, Commonwealth Avenue & Beacon Street, Boston, Mass.

Nov. 9-11-1962, Thermos, Management Institute, School of Business Administration, The American University, Washington, D. C.

Nov. 10-12-Symposium on Lasers and Applications, American Association, Department of Electrical Engineering, Ohio State University, Columbus, Ohio.

Nov. 19-International Air Cargo Forum, Delta Plaza Hotel, Atlanta, Ga. Space and Institute of the Aerospace Sciences, Society of Automotive Engineers.

Nov. 12-13-International Conference on Design, American Hotel, New York, N. Y.

Nov. 12-International Air Transport Association's Public Relations Conference, Sherman Hotel, Washington, D. C.

Nov. 13-15-5th Annual Conference on Magnetic and Dielectric Materials, Institute of Physics, Pittsburgh, Penn-Monroe Hotel, Pittsburgh, Pa.

Nov. 15-16-Reliability and Recovery Seminar, Imperial Hotel, Dayton, Ohio, Aerospace Systems Division's Product Reliability Department.

Nov. 16-17-National Symposium on Material Compatibility and Corrosion Control (Continued on page 7)

AERONAUTICS, AVIATION and SPACE TECHNOLOGY

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Vol. 77, No. 38

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Sparrow III is further proof of Raytheon's ability to manage complex military systems — from early study through design, production and field support.



AEROSPACE CALENDAR

(Continued from page 7)

Jan. 25-26—North American Symposium on Reliability and Quality Control, Sheraton Palace Hotel, San Francisco, Calif.
 Jan. 30-Feb. 1—Fourth Annual Solid Propellant Rocket Conference, American Astronautical Society, Washington, D.C.
 Jan. 30-Feb. 1—National Winter Congress on Military Electronics, Institute of Radio Engineers Ambassador Hotel, Los Angeles, Calif.
 Feb. 11-12—Third International Symposium on Quantized Electronics, UNISOCO Building, Paris, France. Sponsored Jointly by French Scientific Radio Union, Office of Naval Research, La Federation Nationale Des Recherches Electroniques.

Feb. 20-21—International Solid-State Circuit Conference, Philadelphia, Pa. Sponsored by Institute of Radio Engineers American Institute of Electrical Engineers, University of Pennsylvania.
 Mar. 7—Trans-Pacific Meeting, Institute of the Aerospace Sciences, Cleveland, Ohio.
 Mar. 14-15—Classical Propulsion Conference, American Rocket Society, Colorado Springs, Colo.
 Mar. 14-20—Space Flight Testing Conference, American Rocket Society and Institute of the Aerospace Sciences, Cleveland, Ohio.

Mar. 19-22—Second Air Force sponsored Symposium on Sensors, Biltmore Hotel, Dixie, Okla.
 Mar. 25-26—International Conference, Institute of Radio Engineers, American Institute of Aeronautics and Astronautics, New York, N.Y.
 Apr. 13—Fourth Annual Structures and Materials Conference, American Rocket Society and Institute of the Aerospace Sciences, El Monte, Calif., Palm Springs, Calif.

Apr. 15-18—Spring Conference, Airport Operations Council, Shoshone Hotel, Washington, D.C.
 Apr. 16-17—Fourth Symposium on Engineering Aspects of Magnetohydrodynamics, University of California, Berkeley, Calif.

Apr. 19-20—International Nuclear Magnetic Resonance Conference, Sheraton Hotel, Washington, D.C. Sponsored by American Institute of Electrical Engineers, Institute of Radio Engineers.

Apr. 19-21—Electrostatic Conference and Electronic Show, Institute of Radio Engineers, Dallas Municipal Auditorium, Dallas, Tex.

Apr. 24-26—Technical Meeting, National Vacuum Electronics Applications, American Nuclear Society, Netherlands Hotel, Hotel California, Glendale, Calif.

May 3-31—Fourth National Symposium on Human Factors in Electronics, Institute of Radio Engineers, Marquette Hotel, Washington, D.C.

May 7-8—Second Conference on Combustion, Institute of Radio Engineers, Marquette Hotel, Washington, D.C.

May 13-15—National Aerospace Electronics Conference, Institute of Radio Engineers, Denver, Colo.

May 20-21—National Telemetry Conference, Hilton Hotel, Allentown, Pa.

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Laboratory inspection is maintained through procedures such as this electronic equipment capable of testing surface finish within one-quarter inch. In background, quality control inspector uses metallograph to check metallurgical content of aluminum forgings.

Rigid quality control means perfection in materials and machining of every R1830 and R2800 piston carrying our AE number, assigned by FAA. Every AE piston meets or exceeds specifications for original engine parts. Only Alcoa forgings are used. Forgings Zyglobed and metallurgically inspected prior to machining on AE custom-designed, automated equipment. Weights kept within exact tolerances. Air gaging assures uniformity of piston pin holes and ring grooves. AE pistons have been tested and are now used by major overhaul shops and airlines throughout the world.



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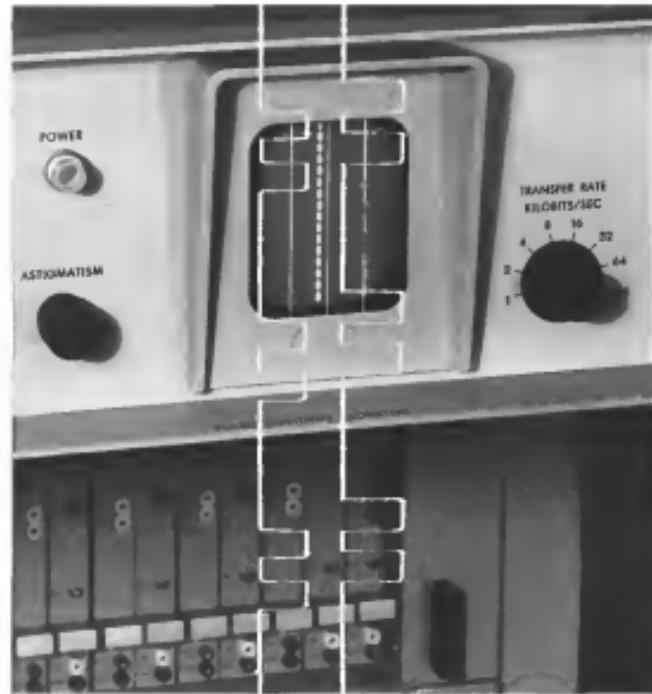
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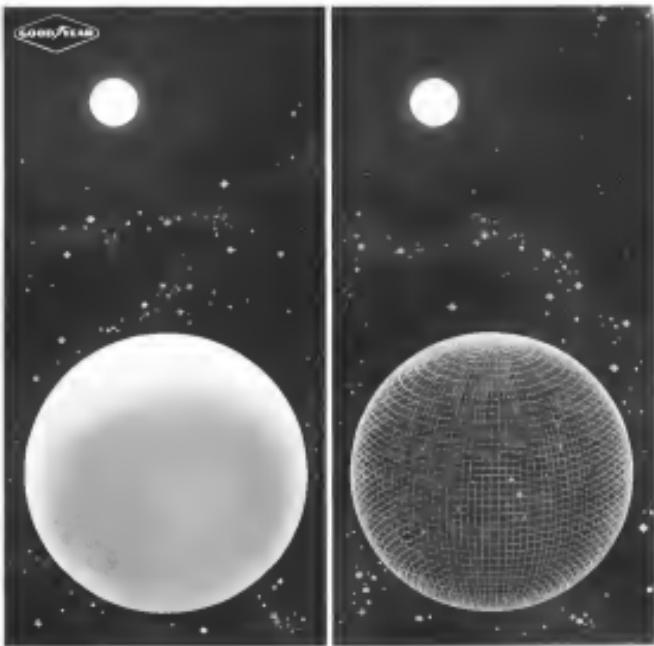
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- Cryopure line • Non-Insulated
- System of 32 Insulation
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EDITORIAL

The Cuban Crisis

The speed and ferocity with which U.S. military power was applied to counter the threat of offensive nuclear weapons in Cuba was as horrifying to the American people and their Allies as it was surprising to their foes. Establishment of the naval and aerial blockade to shut off the flow of Russian missiles and jet bombers to Cuba was certainly the most decisive reply to Soviet aggression since the Communist attempt to conquer Korea was repelled by armed forces of the U.S. and United Nations.

There are still several chapters to unfold in this Cuban crisis and it is premature to reach any firm conclusion yet. However, the initial Soviet reaction in turning back a dozen of its Cuba-bound ships carrying offensive weapons, including the Polaris with a load of IRBMs, indicates the Soviets are wary of pressing their Cuban venture further in the face of U.S. military power. Certainly the next critical phase of the crisis—negotiated by President Kennedy—will come from the choice of methods by which the missiles and bombers already in Cuba are withdrawn or rendered useless.

Diplomatic Deceit

The manner in which the Soviets attempted to art up their nuclear missile base in Cuba should continue to be monitored. That still needs to be confirmed by the other side of accepting anything the Soviet leaders say at face value. For at the very time Soviet Foreign Minister Andrei Gromyko was sitting in the White House awaiting President Kennedy that the Soviets had no intention of supplying Cuba with offensive arms, thousands of Soviet technicians were building MRBM and IRBM missile pads in the Cuban hills, and assembling twenty IL-28 bombers on Cuban airfields, and a stratos of Soviet ships were sailing for Cuba with deckloads of IRBMs and other missiles and bombers. Not since the Japanese invasion of Manchuria in 1931 has there been such a callous exhibition of diplomatic deceit perpetrated on this nation. The speed and magnitude of the Soviet ballistic missile build up in Cuba showed clearly that once again they hoped to present the U.S. with an aggressive fait accompli, and then use it as a lever to extract Soviet impositions by the negotiating techniques of an armed robber.

The Air Force and Navy pilots who flew the photo reconnaissance missions that exposed this Soviet missile base deserve great credit for the skill and courage with which they successfully executed these missions, ranging from the extrametropolitan U-2 flights to the low-level oblique photo runs of Navy F8Us. The legions of skilled photo

interpreters that spotted and identified the vital missile installations are more among heroes of this and other epochs of the cold war's warmer phases.

With the incomparable evidence of Soviet forces gathered by these pilots and photo interpreters, it was horrifying to see an intrumental symbolic within the U.S. government almost lose the total value of these pictures in establishing the validity of President Kennedy's case to even the most skeptical international observers. Soviet snubs in the intelligence bureaucracy strongly maintained that public release of these pictures would compromise "their" intelligence techniques, as though aerial photography was a major risk known only to the death of Langley Code (V-1). President Kennedy's case would have gained even more impact if he had shown these damning pictures on television during his nationwide speech on October 22. But this powerful evidence was encumbered by the prior blemishes in the intelligence arena. The spectacle of Defense Secretary McNamara waving these pictures before a Pentagon press conference—which included Russian reporters—and then saying they were too secret for the American people to see in a vignette of official simplicity that will be hard to top. The American Ambassador to London who "unwittingly" released them to the British press and television deserved his country's thanks and a medal, too, for breaking that bottleneck of bureaucratic absurdity and paving the way for this proof of Soviet perfidy to be plastered around the world.

Long Overdue Move

The Cuban blockade is just the first step in a process—which should have begun many, many years ago—of opposing the extension of Soviet imperialism whenever it attempts to overflow its boundaries. It will require not only superior technical skill, such as the serial aerial surveillance techniques that monitored the Soviet arms in Cuba, but also superior intelligence in their application and the determined stance of national will that cannot be baited or frightened into dismantling the basic elements of a free society.

Because we have reflected so long on the face of this Soviet imperialism and because we have taken as long to strengthen the stark, ugly outline of that threat, the road back will be longer and the task along the way higher. But it is a road we must travel if the world is not to be inundated by a flood of ancient barbarity dished in the modern political dogmas of communism.

—Robot Hawk

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Washington Roundup

Crisis Information Plan

Kennedy Administration is trying to develop a military information policy to fit the recently-won cold war crises like the Cuban one without resorting to the degree of censorship imposed during a shooting war.

President Kennedy himself gave the rationale for such an effort by declining in his Cuban speech that "we no longer live in a world where only the nuclear threat of weapons represents a sufficient challenge to a nation's security to constitute a maximum peril."

White House Press Secretary Pierre Salinger last week took the first step toward implementing a "total" information policy by issuing guidelines to news media on the type of military information the Administration considers "confidential to the public interest." He contended the guidelines are not so far-reaching as to interfere with press freedom to comment, but there is little apparent difference.

Salinger also particularly referred to television interviews which tend to obtain from government sources such specific military information as ship and troop movements. The White House appeal to U.S. news media to "exercise caution and discretion" was to be followed up by discussions with foreign journalists about safeguarding sensitive information.

The Administration is coupling its appeal to the press with strict rules about what military information Defense Dept. personnel can release. White House officials themselves consider the rules stringent. Immediate result of the new rules will be a clampdown on all types of military information until Defense Dept. personnel feel more sure about what they can and cannot say.

Production Stagnation

Defense Dept. last week started calling in aerospace contractors to learn how fast they could increase production if the need arose. The case atmosphere induced the classes that Defense officials would go ahead with some plans to place new aircraft production in private areas.

Political considerations are mounting the likelihood that Defense will choose a second source for producing the McDonnell F-4B Phantom for the Navy and Air Force (F-4C) (AW, Sept. 24, p. 25). McDonnell officials say it would be cheaper to increase production by letting the firm extend its subcontracting, assuming that 57% of the work on the aircraft already is subcontracted.

Explorers Club has recorded in giving more than 50 lectures of aerospace firms to sponsor a dinner in New York, Nov. 2 for National Aeronautics and Space Administration Administrator James E. Webb and the astronauts. The \$100-per-plate dinner is based on the conviction that it is deductible. Part of the proceeds will go into the club's building fund.

NASA's Talent Hunt

For the first time, NASA is employing management recruiting firms in hopes of finding 10 research and development executives to supervise integration and system engineering for manned space flight programs. NASA will pay the Los Angeles firm of Ernst & Young a \$5,000 fee and \$5,000 expenses, and the New York firm of George Fox a fixed fee of \$11,500. Both firms will submit lists of candidates and the space agency will choose 10 for positions paying \$16,000 to \$19,000.

U.S. and Japan are nearing agreement on the location and operation of a ground station in Japan to track Telstar and other communications satellites.

Major Gen. Alfred Starbird of the Army Engineers, former director of the Atomic Energy Commission's military applications division and now commander of Joint Test Task Force 3 conducting the current series of U.S. nuclear tests, has been named director of the Defense Communications Agency. He will replace Rear Adm. W. D. Ross, who has headed the agency since its creation two years ago.

Cuban Refugee Airlift

Airlift of Cuban refugees who supplied vital information about the Soviet missile buildup on the island, ended last week when Pan American World Airways stopped serving there (p. 41). For the last U.S. carrier to accept Cuban refugees, fewer than 300,000 refugees from Havana to Miami were Jan. 1, 1962. Another 30,000 Cubans were waiting to fly to Miami when Cuba ended the service to half

Diplomatic note: New York Post Authority refused to let two B-47 bombers operating 1000 Soviet aircrafts stated to appear in New York land at McMurdo unless the Russians provided information about engine noise. The Russians did not supply the information and landed at Philadelphia International Airport.

—Washington Staff



ONE OF THREE PHOTOS of Soviet IRBM sites in Cuba which were shown to members of U.S. Congress last week during preparation of third launch sites for storage of batches of missiles, probable storage facility for nuclear warheads. IRBM sites have four launch pads each, with one erector launcher serving each pair of pads. They are solid fuel missiles. Missiles have 1,200 mile range. No IRBM has been spotted by early last week. U.S. discovered 8 to 10 sites for IRBM and medium range ballistic missiles.

Russia Avoids Early Chance to Test U.S.

Washington—Soviet Russia avoided its first opportunity for a show-down last week over a U.S. sea and air blockade designed to halt the sudden and rapid flow of offensive Soviet strategic weapons into Cuba. At least a dozen of the two dozen Russian vessels which were headed for Cuba when the blockade began turned back, Defense Dept. said.

The U.S. demonstrated that its blockade—announced Oct. 22 by President Kennedy and effecting at 10 a.m. EDT on Oct. 24—was indeed only at speeded Soviet weapons when it permitted the first Russian ship that encountered U.S. Navy forces to proceed because her cargo was petroleum.

Despite the recent stand at gunrunning, Cuba, led by Prime Minister and Soviet Commissar Nikita Khrushchev, continued in the United Nations and among U.S. allies, Soviet bloc countries and non-aligned nations. But the U.S. expected to have no difficulties of negotiating until it had some guarantees that President Kennedy's demand for "without delay or discrimination" of the offensive weapons would be met.

late last week, the White House and a number of Russian ships still were headed for Cuba and that a war will continue on Soviet missile bases in Cuba.

But for the blockade—the strongest political-military move taken by the U.S. since the Korean War—the discovery of Soviet medium and intercontinental-range missile sites and ballistic tactical bombers in Cuba (p. 37). This is the first time that Russia has not based strategic missiles outside its own territory. These missiles, designed to use nuclear warheads, were brought in with what the State Dept. called

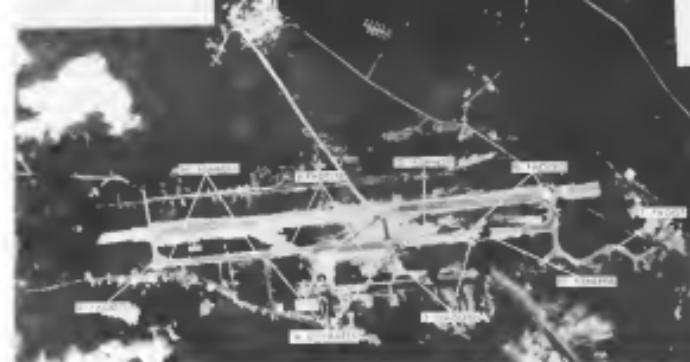
an attempt to take surface-to-surface and/or to surface nuclear bombs, ballistic, aerial and supporting equipment into Cuba, plus any other items that might be added to the list later. Defense weapons such as antiaircraft missiles were not included in the list initially. It was not clear whether fighter interceptors, which could also be used as attack aircraft, were prohibited. Cuba now has at least 39 Soviet MIG-17 fighters and about 60 older MiGs.

A key element in the discovery of the missile sites was the effort of Russian and Soviet intelligence ships to gain the greatest amount of information about the U.S. and Cuban ports and shipping lanes so that they could begin the long expected delivery of offensive weapons to the Caribbean area. It was provided by a great strengthening of U.S. forces in the southern U.S. and in the Atlantic and a sharply increased state of readiness for the nation's military forces around the world (box, p. 200).

About 25 Soviet ships were on route to Cuba when the blockade took effect; another 10 or 12 were in Cuban ports and another 25 were en route from Cuba, according to Defense Secretary Robert S. McNamara.

A little more than 24 hours after the blockade became effective, Defense Dept. said it appeared that "at least a dozen Soviet vessels have turned back, presumably because according to the best of our information, they might have carrying offensive munitions."

The U.S. blockade took force to halt search and if necessary sink any ship of any nation that



SHIPMENT OF DELTA-WINGED supersonic Folland fighters is performed by the high-altitude plane taken from a Lockheed U-2 high altitude reconnaissance aircraft showing a Cuban airfield with 39 Folland with 39 Folland and 20 MiG-17 jet fighters plus numerous anti-aircraft batteries. Those bases already are depicted in the center of the photo. Note the extensive dispersal sites pattern. Follards are used 10,000 to 15,000 meters and they have top speed of approximately Mach 1.5.

Determination in Cuban Arms Blockade

after 8 a.m. EDT on Oct. 25. It was ascertained by the U.S. Navy vessel that interrupted her that the tanker had only petroleum aboard. Defense Dept. said, "39 Soviet petroleum and 20 MiG-17 jet fighters plus numerous anti-aircraft batteries" are included in the prohibited materials.

President Kennedy's precise statement setting up the quarantine, the order was allowed to proceed. The Navy informed that no prohibited material was aboard the patrol ship.

The U.S. did not object that the ship was searched, although the blockade procedure called for Navy and Marine forces to board and inspect vessels if necessary.

In addition to the actions on Oct. 22, about two days of rapid troop shifts and an atmosphere of crisis, President Kennedy had said the purpose of Soviet-held and renamed missile bases in Cuba could be "more other than to provide a nuclear strike capability against the Western Hemisphere."

The President and this already was planned months ago, and it complicated reported movements from Russia and assessments given to him yesterday on Oct. 13 by Soviet Foreign Minister Andrei Gromyko, the White House—Russia was supply intensive Cuban and providing them with defensive weapons. The President had, instead, last Sept. 8 and 13 that any appearance of offensive weapons would represent a threat in the peace and security of this hemisphere.

U.S. strategy officials "have never

been transferred to the territory of any other nation under a cloak of secrecy and deception," the President said. "Turkey and Italy were given U.S.-built fighter-interceptor range ballistic missiles, including an antiballistic missile, and after President Kennedy's precise statement setting up the quarantine, the order was allowed to proceed."

The President called for "prompt dismantling and withdrawal of all offensive weapons in Cuba, under the supervision of U.N. observers, before the quarantine can be lifted." He described this as one of the "initial

Germany Weighs Cutting P.1127 Support

Bonn—West Germany's air force, with a new command and financing budget for 1968, may decide to phase out development of its Fokker P.1127 short-range fighter plane in favor of a more advanced fighter.

Discussions of an air role for the P.1127 project plus cancellation of the West German program for development of the V1010 VTOL interceptor were major subjects of discussion at a recent meeting to review and plan existing programs. The meeting was attended by Defense Minister Franz Josef Strauss and other top officials, including new Air Force Inspector General Lt. Gen. Werner Pfeiffer.

Aside from budget restrictions, Gen. Pfeiffer apparently feels that the problems of logistics support that would be required to meet the demands of large numbers of dispersed VJ 1010s in the field would be almost insurmountable (AWW Oct. 8, p. 10).

Under original programming, the RHD would have replaced the Lockheed F104G in the West German fleet line interceptors in the late 1960s, and Gen. Pfeiffer reportedly feels that, by this time, the mission can be accomplished more effectively and reasonably by medium-range missile units. Test model of the V1010 is now undergoing refueling trials, and a first flight test is scheduled soon.

Gen. Pfeiffer is also interested in a short-range VTOL fighter as a eventual replacement for the Fiat G.91 but, according to a defense ministry memorandum, feels that a review of all technical developments is needed before a firm decision on the type of aircraft to choose can be made.



FIGURE II-21 **TRADE** Four jet bombers are shown being offloaded, attached and tested on the coast of Cuba. Enlarged inset shows 10 cranes unloading B-52 bombers, three fighters mounted and one completely assembled aircraft. Total of 30 B-52s have landed in Cuba during past few weeks. Numerous aircraft are at the port of La Habana. Installation of other type with six launch pads is planned around a coast of the east coast. This is the second generation B-52s, similar to an missile, with the NATO code name Godfather. Bases at this Cuban field have been extended and extensive deposit areas built to protect the B-52s. Bases digits carrying coded dark loads of B-52s, subassemblies as photographed by U.S. military aircraft. Two B-52 landing cranes are visible on one ship that arrived in Cuba while heavy decked (or enclosed) aircraft is shown on another ship headed for a Cuban port (below).



AREAS IN NORTH AND SOUTH AMERICA Areas range of Soviet bombers and missiles now operational or being delivered to Cuba are shown by the three circles on map. B-52 Bomber range of 300 m. (lower circle) includes Cuba, Central and South America. Range of medium range ballistic missiles now deployed in Cuba have 1,000 m. range shown as smaller circles. Range of medium range missiles now deployed in Cuba, are shown as shaded areas. Major bases are: Malmstrom AFB, Montello, where four Minuteman complexes are located; Offutt AFB, Neb., where Strategic Air Command bombers are based; Minot AFB, N.D., where B-52 bombers are based; Lowry AFB, Colo., first operational T-33s; Frobisher AFB, Kans., an operational A-10s and jet bombers base; Whiteman AFB, Wyo., operational A-10s; and Pueblo, Colo., a jet bombers base; and an Atlas site under construction. Range of the missiles extends southeast as far as Peru, and covers all of Venezuela, Colombia and Brazil.

steps" and left a clear impression here that invasion of Cuba could follow if it became necessary.

In an extremely strong statement, President Kennedy and the U.S. world regard, "any nuclear missile launched from Cuba against any nation in the Western Hemisphere is an attack in the Soviet Union on the U.S., requiring a full retaliatory response upon the Soviet Union."

Russia's initial reply stated "a warning message" to the U.S. and if "the American aggressor touches off a war, the Soviet Union would strike a most powerful retaliatory blow." The statement said that, "Wherever under the U.S. flag Soviet ships at the strongest military power at sea but no foundations what ever for this." The statement referred to the blockade as "positive actions."

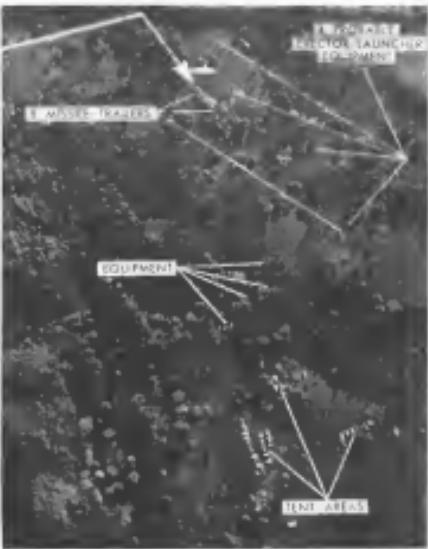
In the hectic period before the President avoided the name and seriousness of the Cuban crisis, he canceled a political speaking tour related to the November elections and invited Vice President Lyndon Johnson, cabinet members and congressional leaders to Washington. He later canceled all campaign tours and speeches for himself, even public events, and invited the entire congressional delegation to the White House to obtain his support.

At Strategic Air Command, and U.S. allies started their military forces. But Prime Minister Harold Macmillan told the House of Commons that Britain's strategic buildup in Cuba was "a deliberate adventure designed to test the ability and determination of the U.S."

He said there "must be no break or wavering amongst the allies. That, perhaps, is the main purpose of the British initiative."

From military reaction to the blockade on Great Britain was the lifting of the British submarine blockade Proteus from its Scottish base. The Proteus normally does not leave its anchorage. One British submarine carrying subs sailed shortly before the Proteus and five more served by it already were at sea.

From the start of the crisis efforts to get a quick formula for peace did not end as until Oct. 25. France was among a number of countries that let it be known sufficiently that it did not appreciate being satisfied with U.S. intentions only after a number of steps had already been taken in secret.



Photos Documented Cuban Arms Buildup

Washington—First hard evidence of the extremely rapid building of modern Soviet offensive weapons in Cuba was obtained exactly one week before President Kennedy reached the world that the U.S. would halt the buildup by means of a naval and air blockade.

This hindsight—no input that Soviet techniques did not take time to mature—languishes the continuation of missile strikes off an incoming US aerial reconnaissance effort that occupied Defense Dept. and other intelligence interpreters and analysts 24 hr a day and provided no evidence “almost friendly” even once throughout the week,” according to Defense Secretary Robert S. Mc

Its late last week, Defense and State Dept had revisited these details on the buildup of offensive weapons—most of which had taken place since early October.

• Intermediate range ballistic missiles: At least three sites for missiles with ranges of 1,100 km are in various stages of construction. Defense Bapa refused to give specific numbers of sites for either medium range (1,000 km) and three are at intermediate-range sites and there are a total of 14 sites of the range considered. Located in the Circles of Gramapuri, Ramnagar, Sri Chaitanya and Sripuram Ghati. The first three are believed to be operational and the last one is believed to be under construction. The sites are well above ground but well concealed. Complex geology

houses serve two launch pads each, and as far as all intermediate and medium-range sites have appeared with either four launch pads or less. McNamara said the U.S. had no missile that would penetrate these Soviet weapons, and that any warning of a launch would be very short.

—Mobile machine-usage bulletin service—These were discovered "under wraps," and several times appeared in the five or six days before the Pennsylvania's announcement on Oct. 12. These are now available. These bulletins, which may take from 10 days to 24 hours to circulate, "an increase of perhaps 50% in the amount of equipment," McNaulls said. These liquid fuel serials have a range of 10,000 miles and are heated in trailers, which are backed up to a combustion chamber where they are then heated to 1,000 degrees. Availability is determined, however, by the number of fuel stations, restricted to a new set and mobile stations within a period of about six days," McNaulls said.

"We have detected the latest type of Soviet weapons using these pos-

referred to Cuba," McNamee said. "The maps, the MRMs and IRMs have not been provided to any socialist entity by Moscow. The surface-to-air weapons are the latest instance that the Soviets are using in their own interests. There are other weapons that are among the most modern that the Soviet Union possesses. We were quite surprised to observe that."

B-28 Bregle trimotor bombers
This sub-section is in regular bombers, with a value of *either* \$100,000, *or* a total value of \$100,000 for the *entire* force. *Cost* value is \$100,000. *Appearance* of these in Cuba was defined for the first time in the week at 10 days preceding Oct. 22 in Berlin; the U.S. observed Cuban planes with early warning radars. *Combat* value is \$100,000. *Performance* for B-28 is as follows:

Please return to processor and later

U.S. Alert Includes Blockade Task Force

Washington—U.S. naval forces increased their state of readiness to the greatest degree since the Korean War in anticipation of a showdown with Russia over the blockade ordered by President Kennedy last week in response to the buildup of offensive weapons in Cuba.

Movement of ships, seaplanes and troops intended the Defense Dept. was prepared to go far beyond a blockade of weapons bound by sea or air for Cuba and invade the island if this seemed the only way to ensure the Soviet offensive weapons there (see p. 25).

The *Mobile*-officially titled a "quonset" by Kennedy Administration officials-officially went into effect at 11:00 a.m. EDT Oct 24. Defense Secretary Robert S. McNamara announced that Adm. George W. Anderson, chief of naval operations, was in charge of the blockade operations for the Joint Chiefs of Staff. Actual operations were to be conducted by Adm. Elmo R. Zumwalt, chief of naval operations, and Capt. Alfred G. Anderson, Adm. Anderson's chief of staff, was assigned to enforce the blockade on the sea and in the air. His authority cut across service lines.

Adm. Anderson operated from the *Fairington* and *Allen* decommissioned from Norkirk, Va. In charge of the blockade operations at sea was Vice Adm. Alfred C. Word, commander of the *Seventh Fleet*, as a blockade task force designated Task Force 113. The Atlantic Fleet includes more than 300 ships, 300 aircraft, 300 aircraft and 410 ships in the Second and Sixth Fleets. Defense and Task Force 113 would include seven aircraft carriers, six anti-submarine warfare carriers, more than 50 amphibious

Such approaches, as carried on by the U.S. Fish and Wildlife Service, the U.S. Fish and Game Commission, and portions of the state fish and game bureaus, may be based on *Fauna of Spain*, translated, to examine southern approaches to *Coleo*. Distractors were expected to be used for actually breeding stages stopped by immature forces.

Chronology of Cuban Military Buildup

Washington—Following a slowdown of the military buildup in Cuba since Field Cdr. Curtis arrived in January, 1959:

- February, 1959: Trade agreement signed with Soviet Russia during visit by Soviet Deputy Foreign Minister Mikoyan. USSR extended \$150-million credit to Cuba.
- March, 1959: Soviet submarine ship fleet up to Havana Harbor. Curtis Mined U.S.
- July, 1959: Soviet Premier Nikita Khrushchev threatened to strike U.S. with missile if U.S. intervened in Cuba, but said this was a "hypothetical" warning.

• September, 1959: Cuba announced that USSR would provide MiG fighters and heavy tanks to Cuba.

- October, 1959: U.S. placed embargo on all shipments to Cuba except food and medicine.
- January, 1960: U.S. broke diplomatic relations with Cuba and imposed economic embargo. President Kennedy warned Russia not to interfere in the Western Hemisphere.

• April, 1960: State Dept. reported that Russia had sent 18 to 25 MiG-15 fighters to Cuba (IAW Ap. 2, p. 15). First plane of Cuban fighter pilots graduated. Cuban commandants did not specify training area, but it was believed to be Cienfuegos Valley. Aircraft were identified as MiG-17s and MiG-19s. (IAW Ap. 16, p. 25).

• August, 1960: U.S. confirmed heavy Soviet buildup in Cuba and several of several thousand Russian technicians. President Kennedy and U.S. had an "understanding" as yet, on air and aircraft patrols in place in Cuba (IAW Sept. 3, p. 31) and Defense Dept. said it was keeping abreast of the military situation in that area.

• September, 1960: Cuba granted use of Havana Harbor to Soviet ships sailing from U.S. controlled ports would be welcome

base for Soviet nuclear submarine. President Kennedy warned Curtis against any action in the Western Hemisphere. Curtis said U.S. had evidence that Soviet anti-aircraft missiles with a 25 mi. shelf range were in place in Cuba along with several Soviet-made motor torpedo boats with 1000-lb. range (IAW Sept. 10, p. 15). Soviet had a "small" air force (100 aircraft) and 1000 men on Cuba, most near the beginning of the year. Secretary of State Dean Rusk invited the four joint meeting in 10 years of the House Armed Services and Foreign Affairs Committees on the Cuban situation. Soviet nuclear missile strength is total more than 4,000. President was given specific authority to call up to 250,000 reserves to "meet the challenges in the free world."

• Oct. 1, 1962: Aviation Week reported (p. 20) that the Cuban air base buildup was seen as Festus strategics as "the first step toward eventual construction of intermediate-range ballistic missile emplacements." Estimates of resources listed in the same article were 70 MiG fighters available for operations, including 10 MiG-17s and the remainder MiG-19s. One MiG-19 was reported flying with 8 to 10 men being transported. Other aircraft included 12 C-14 transports, 24 MiG-4 bombers and 22 An-24 cargo aircraft.

Under Secretary of State George W. Ball gave the first official public detailed report on the Cuban missile buildup in testimony before the House Select Committee on Export Control on Oct. 3 (IAW Oct. 15, p. 25). It should be recalled the Aviation Week report of Oct. 1, but did not mention BOMI holdings.

Stan Kerten (R-N.Y.) and Oct. 13 that com. stations has stated at least six BOMI sites in Cuba, and he called on President Kennedy to give the public the facts on the missile buildup there.

On an order to the nation Oct. 23, President Kennedy confirmed the existence of BOMI installations and other offensive weapons in Cuba, and ordered a missile blockade against Cuba to take effect on Oct. 24 (see story).

Released showed that State Dept. and Defense Dept. had believed that Cuba had "a nuclear surface strength, hardly" a "cavalry-not-bowling" at the bottom of an armament which probably would be covered over after October.

There also is a specially unique part factors in Cuba, unpreceded by a double security fence, that can be intended for holding of nuclear weapons, State Dept. said.

Surveillance missile sites, which the U.S. classified as defensive rather than offensive, have grown from about a dozen at the beginning of October to at least 24 as of Oct. 22, and 22 of these were believed to be operational. The other two could be operational in about a week, according to State Dept.

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U.S. reconnaissance also discovered at least three coastal defense missile sites, located on the main island and the Isle of Pines. Two of them were operational. They were armed, cruise missiles with a range of 35 to 40 mi.

and would be used primarily to hold off ships.

U.S. intelligence also believes that Cuba has a dozen Soviet missile mobile patrol boats, each carrying two launchers for missiles with 12 to 15 mi. range, had not changed early last week. The U.S. said it had no information on Soviet submarine bases in Cuba.

Festus strategics have been concerned for some months that the buildup of defense arms in Cuba was merely a prelude to construction of intermediate-range ballistic missile bases. Thus, given the fact that U.S. aircraft, including Lockheed U-2s, were regularly flying reconnaissance around and over Cuba, the first report by Aviation Week (p. 1, p. 20).

First concrete evidence that often were missile fields were nearing rate Cuba came to Secretary McNamara's attention at 10 p.m. EDT on Oct. 25. It was relayed to President Kennedy at 9 a.m. EDT on Oct. 26. Thus the code-word was "Patriot," McNamara said. "It simply used a strong adjective that there was more than we saw in that previous instance. So we had to go back and mathematically cover our bases."

The President immediately ordered a "grueling" nuclear weapons program, McNamara said. "This involved working on basically thousands of feet of film and trying to pick that kind of a situation out—here are some missile sites over there, and you try to examine the landscape of Cuba and square to this type of site from this type of map, it is a tremendous task."

"And they have been working 24 hr a day since that time on that tremendous amount of material for us to sort out the problems from the magnitude. And it is found on that very, very thorough analysis by really looking at lots of photo strips that in the world, we have this kind of a place, conclusion."

President Kennedy was given a final defensive report at 7:30 p.m. EDT on Sunday afternoon, Oct. 21. He informed his intention to blockade Cuba against delivery of offensive weapons at 7 p.m. EDT on Oct. 22 and demanded "withdrawal or elimination" of current offensive weapons. On Oct. 23, the President issued a proclamation which made the blockade effective at 10 a.m. EDT on Oct. 24.

Materiel prohibited under the block-



PHOTO SHOWS DETAILS of Soviet submarine base site in Cuba. Each site has so-called "front site" base in water, surrounded by its own base. Photo also shows several missile transports, probable light anti-aircraft positions as well as auxiliary equipment.



CUBA HAS AT LEAST three sites, like that shown at left, for Soviet nuclear-to-landfall coastal defense missiles by early last week—the main island and the Isle of Pines. At least two were operational. They use a 35-40 mi. range in one missile. Soviet surface-to-surface missiles on Cuba are believed to be Soviet-made missiles similar to those protecting Soviet bases and cities. Cuba had at least 24 sites, 22 of which were operational by early last week. Most were a 25 mi. range, provide coverage for most of the island. Some of these sites probably recent overbuilt facility. Photo at right shows missile transports, four missile drivers, 12 missiles.





RIGHT TO LEFT Surface-to-surface ballistic missile sites are in the four areas designated on the map above. Cuba and the U.S. sites are indicated. Besides these 24 surface-to-surface sites are scattered over Cuba. Soviet-supplied over buildup also includes jet fighters and bombers based at Cuban airports undergoing re-armament. MacDill AFB, Tampa Fl., MacDill AFB and MacCoy AFB both near Cape Canaveral, and Key West, Fl., are some of many U.S. air activity during year. Also shown are import Naval bases at Guantanamo Bay in Cuba and Roosevelt Roads, Puerto Rico.

ade mobile, surface-to-surface missiles, bombers, bombers, air-to-surface missiles, and missiles, weapons for use of the above weapons, nuclearized or electronic equipment to support or assist the above items, and for other classes of nuclear hardware designated by the Secretary of Defense for the purposes of effectuating the proclamation."

McNamara said the U.S. "are fully aware that these missile sites are being constructed by Russia and that the surface-to-surface missile systems are being tested and operated by Russia. These systems are highly technical and because they have not been tested and there has not been time to train the Cubans in their operation."

"It seems now clear that there are several thousand Russians on the island now performing nuclear functions," McNamara said.

Concerns for the MRBM's are "aligned to a specific section of the U.S.," McNamara said. In the case of one launch site, where photos made on June 24 by sport showed a 50% error in engagement, McNamara said:

"The pattern of ten rapid deployments has been going on throughout Cuba. State Dept. spokesman and others have reported this."

"All the MRBM and IRBM sites are described. It's reported locations," said U.S. defense sources, "and it's almost certain that there are installations for at least a second stage," State Dept. said.

"So there has been a very rapid movement of missile MRBM's as the sites and into the process of activation. Having these have been in Cuba, I can't understand. These have been moved in otherwise hidden prior to the time they begin to move along the roads and move into the area."

U.S. spokesmen have theorized the strategy and the methods of the nuclear buildup. Never before, they said, has either Russia or the U.S. effected a

dozen of nuclear weapons either secretly or rapidly enough to upset the balance of forces in a somewhat length of a normal time that to do so might trigger a nuclear war.

Soviet MR-21s—totaling 18 by early last week—have moved in the seven bridge sites, but this is a movement of an allies of MR-21s of various types which began moving in Cuba more than a year ago and apparently are considered a part of Cuba's defense forces. Total number of MR-21s at all types, first reached 180 in early last week, State Dept. said.

State Dept. spokesman, using the MRBM example referred to by McNamara, showed one pattern with 45 to 50 vehicles and a few days later no missiles or engines. Another photo of the same site, taken 24 hr later, showed arms mounted four abreast, 27 mm capable of housing 500 wns, and 100 vehicles.

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McNamara said an U.S. reconnaissance plane recently had been landed down, but he would not say whether they had been shot at. He said he thinks it is possible to camouflage the missile sites and I believe this could have done so during the construction period had this is chosen.

"I think that there is evidence that they were operating with such speed and such scale that this did not take the time necessary to camouflage."

Republic ph stainless steel helps keep Titan on target



Balanced on a 400,000-pound stream of thrust, a USAF Titan II ICBM cracks the cool Canaveral morning.

Clustered within the missile's second stage are four vernier rockets. These rockets—their spherical cases fabricated from Republic Precipitation Hardenable Stainless Steel—play a vital part in Titan's jet steering system.



TITAN ON TARGET

from preceding page

From boostoff to final power cutoff, Titan's solid fueled vernier rockets stabilize and position the missile for precise trajectory. Rockets operate in conjunction with an all-inertial guidance system.

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AIR TRANSPORT

U.S. Would Block Soviet Airlift to Cuba

Long-haul Moscow-Coskry-Havana route is the only access; Russian aircraft trying it will be 'forced down.'

By L. L. Dohr

Washington—Any attempt by the Soviet Union to establish an airift route between Russia and Cuba would be confined to the 4,000-mi. nonstop route between Coskry, Georgia, and Havana and would be subject to U.S. air interception.

A State Dept. spokesman last week told Aviation Week that if the Soviets insist on sending aircraft out Cuba, such planes will be "forced down" well before reaching their destination on the island. This could be an amplification of Defense Secretary Robert S. McNamara's earlier statement that it precludes to enter airift inspection had been out.

All Cuban exports were closed to the Soviets. Russia is not known to have bilateral agreements with any South American countries, which are located so far from most points between Africa and Cuba. The Scandinavian airlines have also refused transit rights to the Russians, which prevents them from flying the North Atlantic route.

This leaves the Soviets with only the Coskry-Havana route, as an aerial route to Cuba. A State Dept. spokesman indicated that it is doubtful that an attempt would be made to conduct a supply line on this long-haul route.

Shortly after announcement of the Cuban blockade, the Cuban government sealed off the island from all scheduled airline service by announcement of an emergency pilot-in-command of Cuban territorial waters.

Now, of passengers and aircraft from

joined their Havana service, three months ago KLM Royal Dutch Airlines suspended its regular service between Moscow and Havana and between Havana, Kingston, Aruba and Curacao. Flights to Manaus to Kingston and Aruba should be continued by short-haul Caribbean carriers.

Two Airships of Spain, which operates nonstop service between Madrid and Havana, canceled the reinforced flight Oct. 20 without explanation, but expects to resume the service in the future.

Barclay Overseas Airways Corp. has canceled its flight to begin Cuban territory, as far as Santa Clara, and Curacao Eagle took similar steps with its Venezuelan flights to Jamaica.

In other developments growing out of the Cuban crisis, the Federal Aviation Admin. plans drastic restrictions on all aircraft flying between the North and South Banks of the Florida peninsula. Under a special Civil Air Registration proposal, to take effect immediately, any plane taking off without safety permission would be shot down.

Pan Am has been operating two round trips daily between Miami and Havana. Flights into Havana usually have been empty, and those destined filled to capacity. The current crisis has not yet affected its regular morning flight but departed, and that flight, along with all subsequent flights, were canceled.

Other U.S. carriers adhered to the Havana-Buenos Aires, Delta Air Lines and National Airlines' decision

to cancel suddenly, cause a half-billion dollars in damages to airline passengers, as of late last week, as agreed temporarily by the two.

Pan American World Airways, the last airline left Cuba, nonstop about Dec. 22, and all flights from Cuban airports ground control have been suspended. Under a special Civil Air Registration proposal, to take effect immediately, any plane taking off without safety permission would be shot down.

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Cuban Airlines, which has been operating on a limited basis under the Castro regime, also was grounded and forced to stop all services. Its Cuban flights and Prague, Fla. Oct. 24, a Cuban-British flight from Prague to Havana, stopped at Cuban Rio, likewise, for refueling because Conder was enroute in an Antonov 10, all baggage aboard was checked by customs officials and a member of the Royal Canadian Mounted Police, but there was no sign that Cuban refueling stops at Cuban

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KEY WEST AIRPORT Traffic controllers work in open while attempting to handle increased traffic in the South Florida area. Construction of new tower is going on simultaneously.

FAA Distributes Airport Disaster Plan

Washington—New disaster control guide is being issued to U.S. airport authorities in the Federal Aviation Agency. Distribution of the 36-page pamphlet, which describes what should be done in the event of modern attack, probably is not related to the Cuban crisis.

The general function of airports once their bases and possible target centers and existing sources of damage might result from a nuclear strike after close air support operations might take as several hours, the guide states. It does not attempt to tell an airport to do what Soviet targets may do in the U.S. Airports are asked to maintain the following basic functions, which probably do not follow a nuclear attack, according to the guide. Some of several measures include construction of shelters and separation of areas to measure the intensity of radiation.

FAA also recommends that each airport appoint a disaster control officer, who should "establish contact" with local and state civil defense authorities and military units "to link the airport program with the efforts of these organizations."

Employing somewhat vague language throughout, the guide cautions that the disaster control officer develop procedures for all emergencies before establishing disaster control centers, train disaster control teams and work out control and agreements with local organizations.

Disaster-control operations following a nuclear strike should be under a single liaison officer. If such efforts are successful, "your airport could serve as the left field or second line of defense," the guide tells local operators. It also warns that radio communications for notifying civil defense agencies for evacuation and supply can lose these functions if they are not maintained over existing communications nets.

The guide was prepared in response to President Kennedy's February 1962 executive order, which gave to FAA responsibility for ensuring the emergency management of the nation's civil airports. The guide was first drafted at Wolf Chalkfield Field, which served the Minneapolis-St. Paul area. If it is available through FAAs Anchorage Service.

ports would be barred during the crisis.

For some time, Pan Am's Aeroflot has been making a route to the Western Hemisphere with Cuba as an alternate destination (AW Nov. 25, p. 36). Perhaps as war traffic shifts into the U.S. and South American countries, coupled with the Scandinavian airlines, have on recent rights, has forced the Soviets to consider this on the American route.

Once the route to the U.S. is established, the first flight, Pan Am's Aeroflot, would conduct the route according to the State Dept. The Russians' established continental links toward understanding the Cuban aspect so it would serve as a stepping off point in the Western Hemisphere on the way from Moscow via Bulgaria and Rumania to the west.

Plans to settle a bilateral agreement between the U.S. and Russia were abandoned last summer in the U.S. administration's foreign policy. To have had a strong desire to launch the agreement (AW Aug. 6, p. 30), the U.S. did not care the proposed part of a general exchange of traffic rights.

Plans at stake were considered jointly by the U.S. and the State Dept. did not care to come into any agreement that suggested reciprocity in long as the cold war threatened to turn hot. The Russians expressed disappointment over this decision.

It was the ultimate goal of the Russians to get the Moscow-New York route and then seek routes from New York to Cuba. This having failed, the Russians turned to South America.

hen when Cuban was having maintenance difficulties, principally in the functioning of turbines. The team was recently recalled and anti-aircraft Sheldley Petrie, engine technical representative remains in Cuba, as a representative's aid to Cuban Air Force.

Because of the limited service operated by Cuban and CSA lack of operating experience as the team to Havana, Aeroflot and Transair, instructions and directions applicable to the Russians will be helpful. In some cases, it will suffice to use as a supply line for weapons or troops. If this should be attempted, however, President Kennedy has stated that he was prepared, "if needed," to extend the shipping blockade to other "types of cargo and crews."

Meanwhile, western carrier flights from Miami and other Gulf Coast terminals in South America will be severely affected by the non-Cuban flights. On the other hand, military flights carried out by U.S. and government contractors, such as Bell Helicopter, will be helped. Aeroflot, the airline, which may receive funds need to conduct regular flights from Cuba.

Debtors in the east generally make about 30 min. to unimpeded flights across the Caribbean. To avoid flying over Cuban territory, aircraft will be forced southeast to the Cuban bases on South Ciego Island in the Bahamas, then southeast to Portau-Prince in Haiti.

The big loss South Cuban to Portau-Prince, about 130 min. and east Cuban to Portau-Prince, 100 min., will be the most difficult. Most flights will be conducted around the air bases from the point to least the Florida coast, and there, a little likelihood in airbase would not all come off if one is impeded with local solo facilities.

In late Dec. 23, Notice to Airmen (NOTAM) the Russians are nonstop traffic control center turned all civil flights in Cuba, over Cuban as territorial waters. No flight, airline, non-exception, can cross these routes to South American governments, which in turn have issued a temporary ban on flights to Cuba. The Russians, however, apparently perceive this has not been applied to.

The Cuban government left itself a loophole to prevent interception of leased or chartered aircraft. It said that flights "first authorized and approved as chartered" could enter Cuba until further notice.

Latin American Division of Pan American, which operated a Douglas DC-7 on the route, asked what civil flights "first authorized and approved as chartered" would appear. It was told by Havana officials that Pan American's service was not among those.

Even before it issued the special CAR, authorizing flights in southern Florida, FAA had directed all U.S. en route

operation to comply with the Cuban Nation.

Under international agreements, Cuba has the responsibility for controlling air traffic within a broad area called the Havana-Honduras International Region (HHR). In this respect, we took the appropriate Cuban, which U.S. airlines will try to avoid.

Although the carriers do not consider Cuba a major air traffic bottleneck, the western route that skirts the Iberian FIR may pose some problems. Its course lies almost entirely over water, and there are few refueling points en route.

Moreover, the western route takes nearly 15 hours, as of Cuba's western tip. Cuba's westward passage of Pan American Air Force continues the line of San Juan, where U.S. intelligence has reported the concentration of MiG-21 fighters. Airline pilots en route to Central America's capitals have reported encounters in which MiG's flew their wagons for many miles before turning back to Cuba.

However, there were no signs late last week that the Cuban situation was seriously curtailing the flow of commercial air traffic through the Caribbean. At Miami International Airport, officials said that no airlines had made changes in service despite the fact that the terminal was being used as a refueling stop for military flights. Miami, which added a second runway capacity, and added supplemental additional flight lines, is a prime example.

As Transocean Air and the Defense Dept. had made requests for information on the "availability of certain aircraft under certain conditions," but ATA would not elaborate on what that meant. It is almost certain, however, that the Civil Aviation Air Fleet (CRAF) will not be activated until the crisis grows beyond the Caribbean.

Under the CRAF program, U.S. airlines make more than 200 long-haul transports available to Defense Dept. during national emergency conditions. But activation of CRAF would have a disastrous effect on domestic airline schedules, and therefore is considered almost ruled out.

If extra airlift is needed by Defense Dept., Military Air Transport Service—the single provider for all the armed services—can and probably will acquire it through one of two other methods. First, MATS can exercise the so-called "expressman" clauses in the contracts it has awarded commercial carriers. These permit the supplier to use part of the aircraft to provide specific loads to the government, to be paid per mile flown.

Second, MATS can broaden its airlift base to avoid short-term "self conflicts" by working with surplus capacity. There can be accepted or rejected by the airlines.

Airline Executives To Probe Idlewild Noise

New York—Concerned that still inadequate noise abatement will be imposed by the U.S. Environmental Protection Agency (EPA), in its attempt to quiet the airports about which U.S. airlines will try to avoid.

Following a public hearing last week, Lehman said he would further discuss his views on the committee as the main problem before deciding whether he should seek legal means to correct the reported nuisance to communities.

And I want the airlines' top brass on that committee, not their subordinates," Lehman and Gatz group, including American, Air India and Pan of New York. Authors will be summoned, he added.

Anton J. Tolos, executive director of the Port Authority, said Lehman's last week's hearing that sufficient legal precedents already exist for handling noise complaints in the courts.

Malcolm A. MacIntyre, president of Eastern Air Lines, emphasized such has a mission outside legal channels, using he was backed in this approach by Charles G. Tilghman, Jr., president of Trans World Airlines, and C. R. Smith, president of American Airlines. Edward E. Gatz, communications president of Pan American World Airways, also added he has no legal capacity and could not recommend additional flights in a prime revenue period.

Lufthansa emphasized that there no intention of curtailing air service to New York, but he is not going to allow his aircraft for acceptable solution for all parties involved in the noise dispute.

No Agreement Seen On IATA Cargo Rates

First agreed on cargo rates will appear high, which last week at the International Air Transport Association meeting that retention of CRAF would have a disastrous effect on domestic airline schedules, and therefore is considered almost ruled out.

Passenger rates in the Pacific and Middle East areas were still in dispute as the conferences ended one month ago. Most delegates believed a "crossover" date on both specific commodity and weight basis was near.

Determination of Pan American and SAS to work individually on charges for express mail, including Lufthansa, Iberia Airlines' non-IATA rates (AW Oct. 21, p. 36) will lead the way to a final decision on North Atlantic rates.

Compliance was reached on the com-

mercial "subsidy" resolution, which would permit their carriers to deduct an operating subsidy if an airline suspected of violating tariff regulations failed to give a share to those carriers. It is the decision that may postpone the resolution on grounds that in the South American route, the limited number of carriers would make it difficult to muster the support of two more airlines to consider a third option.

The conference voted to grant an exception to Bonaire to permit it rate for passage of the resolution. A unanimous vote is required for approval of all terms and conditions.

Air France reportedly has been the major stumbling block to agreement on cargo rates because of its desire for a higher rate. None of more than 200 specifically commodity rates proposed at the conference was approved, with the French being the lone dissenters in a majority of the proposals.

Generally, however, widespread differences on the majority of these rates have kept the cargo conference in a tight deadlock.

Safety Experts Study Successful Ditching

Washington—Civil Aviation Board safety experts are taking a close look at how 101 persons on board a chartered Northwest Airlines DC-7 were evacuated by crew members after the aircraft had been ditched in the ocean near Sitka, Alaska.

Procedures employed during the water landing could set a pattern for changes in the Civil Air Regulation which CAB may recommend to speed extraction of aircraft involved in other survivable accidents. More generic were used during the Oct. 27 ditching than in other similar incidents in U.S. or foreign.

The DC-7, chartered by Midwest Air Transport Service, was carrying a number of tourists and children when a massive propeller fire forced it down in the ocean near Sitka Harbor. During the same the plane was about, almost 30 min., from land when transferred to five life rafts.

Before the DC-7 sank in about 500 ft of water, all of the passengers and crew had been picked up by a Federal Aviation Administration plane.

CAB has not yet decided whether to issue the aircraft from the license CAB is considering a check to determine why the DC-7 could not remain airborne with three of four engines operating normally.



BOEING 320C AIR FREIGHTER carried by American Airlines has 90,000-lb payload capacity, with space for 22 cargo pallets. Four of the aircraft were ordered for \$10 million. Above, powered by Pratt & Whitney JT3D-3 turbines of 15,000-lb thrust, is new freighter

American Buys 4 Boeing 320C Freighters

New York—Major round-trip freight rates and increased airfares on domestic shipments are expected as result of American Airlines purchasing four Boeing 320C freighters.

Saidly said the encouraging growth of cargo volume prompted American to buy the freighters.

"We're in the game where we had to make a decision," he said. "Frankly, we have been pressed to keep up with the demand with DC-8s."

Each freighter is expected to be up 600 ft in the first three months of the year. The airline anticipates it will be 155 million freight ton miles in 1965, compared with 128 million in 1961. Approximately 75% of American's revenue comes from freight.

American operates 34 DC-7Ps each with a 12,000-lb payload capacity. Based on greater payload capability and utilization due to speed, the 320Cs will more than double the life of American's present passenger fleet.

Both the 320Cs will operate at a maximum operating cost of 4.00 cent per ton mile, and in computing over 10 cents per ton mile when calculating operating rates are added. Direct operating costs, also a DC-7P is 12 cents a ton mile, he said.

Daily utilization on the DC-7Ps averages 7 hr per airplane day. American feels it will be somewhat higher on the

320Cs, although Saidly did not predict the increase.

It will feature a roller and track loading system developed by American Machine & Foundry in cooperation with American, Saidly said. Track pallets can be placed in the cargo bay, being through a 7 ft. 7 in. x 11 ft. 2 in. door forward of the cargo bay. Pallets are positioned manually on the roller tracks. Saidly said less than 10% of the freight pallets cost went into the track loading system.

Each 320C has a maximum ground equipment, a full freight load can be loaded and unloaded, placed aboard in 1 hr., Saidly said. American is continuing its research into more efficient and faster ground-handling equipment, Saidly said.

Aircraft will be used for transoceanic airfreight service, Saidly said, and perhaps in such short segments as Detroit-Chicago when demand justifies nonstop flights. The planes will concentrate on the major, long-haul markets, with American retaining some of its DC-7Ps to support aircraft for lessonservice point-to-point flights.

Saidly said that American will possibly sell its present freighters, and may buy more jets as the market expands.



WIDE ACCESS DOOR of the Lockheed C-141 is evident on wood deckup (above). Loading platform, which extends with door opening, is adjustable to trucked level, provides strength in loading explosive. Wing block of the C-141 (left) is assembled in Lockheed's West Coast facility. It will be shipped in sections to the Minotaur, Ga. plant.



Versatility Key

By James R. Ashlock

AIRLIFT—Converting the air cargo field that the C-141 jet freighter will be an efficient for commercial aerospace is for military service in a major project of the Lockheed-Georgia Co. sales group. L-300, civil version of the C-141, is often regarded as commercial cargo nuclei in nearly as adoption of a military concept. Indeed it also aims as proof that the L-300 has range and payload limits below those of jet freighters which will be available well ahead of the L-300's projected 1986 availability date, and at costs comparable to the L-300's anticipated \$6,000,000 price tag.

Comments about military design a candidate," says H. S. Hopkins, sales representative for the L-300. "The aircraft is just as it was designed as an efficient, low-cost aircraft in its commercial application."

Lockheed is promoting the L-300 as a versatile freighter suitable for operation in the regional to international range.

"We believe that by the time this airplane is ready, there will be a need for it that jet freighters now being sold can not meet," Hopkins said.

He continues that Lockheed is anxious in its definition of the C-141 cargo transport role L-300 as a "design for the future."

Even though current production is based on the military version—understandable since the C-141 is a government contract project—Lockheed has not looked in its consideration of the commercial aspects, Hopkins told *Aerospace Week*.

L-300's ability to operate at \$6,000/ton means it often commands by cargo authorities who consider loadings as the key to air freight success. But Lockheed is confident that a changing air cargo market will make this a preferred route.

"It is reasonable to forecast that the cargo market will expand into areas that have no air freight service today," Hopkins said, citing the continued de-centralization of industry. "This will generate a shipping demand which the L-300 can serve from airports having only 5,000-6,000-ft runways."

Lockheed's performance claims show that even on a 100°F day, the L-300 can lift a 110,000-lb maximum gross weight from a ten-level runway 7,500 ft long.

Because the C-141's military requirements call for a 70,000-lb design payload, the L-300 has generally been assumed to have the same. Actually, the L-300 often has 90,123-lb maximum payload maximum, although it can even

Point in L-300 Commercial Sales Effort

that weight over only 500 foot mi.

Payback/usage capability chart shows that the L-300 is able to earn \$8,570/lb per year at the rates assumed: \$450/lb cargo load. The L-300's maximum payload is 90,250 lb, 2,000 ft high, and 94,250 lb on 10,000 ft runway.

Direct operating costs for the L-300, based on the 1980 Air Transport Area forecast, indicate that it will fly for 4 costs a ton mile on aircrafts between 1,000 and 3,000 feet mi. Absence of a single, defined low point in the direct operating costs, such as is characteristic with most path freighters, is an asset Lockheed emphasizes in its promotion. It is carrying the 90,123-lb maximum payload on a flat-surface air freight would cost only 4 cents a ton mile, Lockheed officials said.

"This capability of high cube density is a real advantage," Hopkins said, "and is a good argument against those who feel the aircraft has too large a cargo door for practical commercial operation."

Hydraulically operated air loading doors, called "pistol doors" because of their two-part, outward-swinging design, differ from those of the C-141 in that any air opening is provided. On the C-141, a smaller version of the door may be opened for dropping small items in packages.

Elsewhere, the single door of the L-300 is not only lighter, but allows better accessibility to that not only does an aircraft's cargo door, than that of Douglas DC-8s or Boeing 707s, Lockheed officials say. The loading ramp, which is part of the primary liftdeck when closed, is 50 m. above the ground and with a 50% load factor and a utilization of 50 lb per explosive duff."

L-300 gains efficiency by not having to lift 7,600 lb of equipment installed on the C-141. Metal items in the floor, which is 3,500 lb lighter on the L-300. The C-141 flies in heavier because of a military requirement that it sustain landing on paved roads such as runways and airfields. Strength for such items not considered necessary on the L-300.

Other weight cuts include light station and avionics equipment, 1,100 lb; troop provisions, 1,907 lb; winch fixtures, 496 lb; and miscellaneous, 396 lb.

Removed of the military provisions provides an additional 220 cu. ft of cargo space beneath the flight deck, including a special loading compartment for high-value items. Lockheed is also prepared to offer 110 cu ft package areas in the lower landing gear pods, using space devoted to such areas as an auxiliary power unit and life raft on the C-141.

C-141 will be flown by a four-man crew, with berths and seating for a second four-man relief crew. Net the

the loading and unloading operations.

Hopkins says that to minimize wear and tear requirements, both the C-141 and L-300 are relatively conventional in design. The cargo bay adds 75 ft to the aircraft's overall length. The last 11 ft is on the adjustable loading platform, which slopes 11 deg when elevated. Floor width is 13.3 m., with a surface on center line. The cargo height is 9 ft 6 in., approximately 2 ft higher than current freighters such as the CL-44. The 90,123-lb maximum payload is based on a 16 lb per cu ft density.

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Although Lockheed has been working on landing gear control, there is no plan to convert the jet freighter.

Lockheed feels that the L-300's landing gear is the most practical possible for all standards, especially its location for maintenance since it is contained in pods on either side of the fuselage.

"The gear is dimensionally short,

rigged, simple and has heavy backup



WIND TUNNEL MODEL of the C-141 illustrates design of the Lockheed jet freighter. Because of its location atop the tail, the horizontal stabilizer is smaller than would be required if it was attached to the fuselage, resulting in a weight saving of over 2,000 lb. The C-141 has a design payload of 78,000 lb.



ADVANCED SATURN, shown in artist's concept drawing, will be the world's largest rocket, standing over 370 feet high and weighing 15 tons at launch. Takeoff weight will be approximately 6,000,000 pounds. A National Aerospace and Space Administration program, Saturn will be used to power orbiter and space

flighters, including the three-man Apollo vehicle's boost flight. Saturn will be able to place 100 tons in earth orbit, or transport several tons of equipment to Mars. During funds NASA contract to develop, build and test the S-IC first-stage booster, compressors and engines developing about equal to about 600 million horsepower.

Capability has many faces at Boeing



AIR CARGO carries an up-to-date Boeing 747-200 cargo jet. Shown here for two customers (Pan American and Federal Express), 747C can carry 42 tons at 215 mph, providing 1000 shipping destinations nonstop nonstop.



MISILE LAUNCH. B-52 Air Force pilot shown. Boeing B-52 launching a long-range missile, the nation's first air-launched ballistic missile, now called the Thor missile. It can carry 1000 pounds of warheads and has a range of 2000 miles at 5000 mph. It can be launched from 30,000 feet and from 1000 feet.

BOEING

HOT SHOT continuous-flow staged research model in a research wind tunnel of environmental test facility at Boeing's St. Louis plant. Wind tunnel speed of 12,000 mph, altitude of 215,000 feet, at temperature of 3000 degrees F.



BSAF F-4 is taking off from Moody Field, Ga. Aircraft is acting as testbed for the Pratt & Whitney TF33P-21 21,000-lb thrust turbofan engine which will act as the powerplant for the Lockheed C-541A Starlift. Engine, which is a growth version of the TF33B, is about 10% more powerful than the TF33 which powers the Boeing B-52H. It is mounted under the right wing. Left engine, powering the aircraft is the TF33P-21 turbolike rated at 16,000 lb. thrust. The F-4F is being converted to the TF33P-21. (U.S. Air Force photo)

structure in an ideal place for growing buildings," spokesman says.

One handicap facing the L-101 is its weight in relation to the power strength of aquifer from which it is designed to operate.

Lockheed is cooperating with Federal Aviation Agency as an airport serves in a study of this problem. (AW Oct. 22, p. 27)

Pratt & Whitney TF33-6A turbolike engine of the L-101 will call Lockheed's turbolike engine into play. Lockheed feels the engine cannot be beat. It has an 80-mph maximum jet speed. It also gives the aircraft a safety factor of special significance.

Lockheed says Lockheed is raising the high power advantage given by the turbolike engine C-130 Hercules through to the C-541. The C-541 is often operated on two engines during long-distance flights by the Conn. Guid. Service.

C-130's performance chart shows a climb of 10,000 feet in 1000 ft. at 100,000 ft. with a 264,000 lb. gross weight and 2,800 rpm at 5000 ft. It can do two engine takeoff with a 20,000 ft. with a 280,000 lb. gross. All climb rates are based on maximum continuous thrust and standard temperatures.

Miller's spokesman of the TF33P-21, designated the TF33P-21 and tested for use on the C-141, is undergoing flight evaluation on a B-46 testbed aircraft.

E. A. Cleveland, assistant chief eng.

neer for C-141 development, says Lockheed crews of wide variations in the design criteria obtained from individual commercial carriers on their roles of individual flights.

Moreover, previous reports suggest from 20,000 to 200,000 lbs. for range at 1,000 to 4,000 feet. mil. cruise speeds from 210 to 600 ft. engine compartment volume from 3,000 to 14,500 cu. ft., and continuous gross weight takeoff field length from 3,500 to 10,000 ft.

"It is not surprising that any single carrier can truthfully write that this plane does not fit its requirements in every detail," Cleveland says.

"It does appear from our continuing studies, however, that the fundamental payload/range speed, range, compartment size and impact performance of the aircraft are in optimum in respect to these basic requirements at any single cruise speed," he adds.

British SST Tests

London-Based Avroport Establishment has such stated aims as cooling and air-conditioning systems for aerospace aircraft, with emphasis on aerospace aircraft, passenger, passenger, cargo

and cargo aircraft. It has been built at RAE Farnborough to test aircrafts in a Mach 2 transonic transport and the TSR-2 supersonic strike and aerospace aircraft. Later was a supersonic transport aircraft was in under development, and the supersonic transport project is still being negotiated between British and French governments. (AW Sept. 17, p. 34)

Farnborough testhouse has built a passenger cabin section 32 ft. in diameter and 20 ft. long mounted in an altitude chamber. Max temperature up to 500F will be simulated by 1,400 infrared heating elements mounted around the cabin. Cabin is fitted with 24 seats which will be used for 10 passengers. Cabin has only two stages, and hours of a chamber. At 200F cabin temperature remains constant at about 60F. Labors two can complete flights up to Mach 5 at 80,000 ft.

British government approved of the testhouse and expect the first "Under the Wings" flight, probably, to be made in approximately 513.75 radials, to be spent in construction of a four-story technical building, an additional large and high-level maintenance and overhaul workshop.

Original proposal (AW Jan. 8, p. 43), which called for about \$11.75 million for a five-story tower, larger runway and additional inclined runways, was deleted by a bare majority in a public vote in June, 1962.

Get new ideas in marine communications --



Today, all units of a Navy task force can speak to a combat division using radio wave relay. □ The sea force is synchronized by a high speed information network called the Naval Theater Data System (NTDS). The system is linked together by Collins data transmission and SSM radio equipment. □ NTDS gathers combat information from shore and radio throughout the task force. Data is transmitted to the center of several task force computer systems. There it's processed into an up-to-the-minute and survival picture and relayed to the Task Force Commander and all unit commanders. □ Collins also has developed an airborne version of NTDS and a number of special-purpose radios and data communication systems for ships and fleet aircraft. Collins' Louis C. Hartman Systems are providing information for navigation, cable laying and repair, AWOS and other applications where combatant position finding is vital. □ Collins marine system specialists may have already answered an important question you're living now: Why can't we speak immediately with that commanding officer for shore, equipment and maintenance service? Call Collins Radio Company, Adams 5-2331 in Dallas, Texas.



Study Disputes Airlines on Deficit Issue

Washington—White House study of international air transport policy will take issue with the airline industry's stand that air transportation has been a factor in the U.S. international balance-of-payments deficit.

The White House steering committee, which will make final recommendations on an international air policy at the moment on Dec. 1 (AW Oct. 35, p. 45), has not fully developed all details of its proposed law. Last week, the committee was still in heated discussion as to which facets of the study prepared in private committee will be used in the final recommended policy.

However, it now appears that the balance-of-payments issue as proposed in the basic study will be adopted in one of the recommendations which will go to the President. In essence, the study states that balance-of-payments is one real problem in the existence of the relationship between foreign and U.S. flag carriers.

Last week, Stuart G. Tipton, president of the Air Transport Assn., explained in earlier statement that the balance-of-payments deficit "gives urgency to the need for legislation to deal with foreign carrier destruction and exports position." He added:

"Air transportation is just as much a factor in our balance-of-payments problem as are tangible commodities and services. In fact, the foreign flag airline deficit that a U.S. airline has a lesser impact on the balance-of-payments in the purchase of an imported airplane. To the same ratio, when a U.S. airline serves a market of foreign countries, this has a similar impact on our balance-of-payments as the export of a U.S.提醒器."

The White House study will argue that the situation, while remote, falls into a part of the study. It will show that the balance-of-payments in air transportation focuses on the U.S. balance.

■ Foreign flag carriers purchase the vast majority of their aircraft, a large number of engines, spares and parts here, paying a dollar floor in the U.S.

■ Foreign flag carriers serving the U.S. spend substantial cash here in advertising, fuel, wages and rentals of miles office, ticket counters and hangar space, adding to the dollar flow.

Tipton holds that the balance-of-payments deficit in air transportation is about \$300 million. He bases this on an average term of three and half years to eliminate export-import deficits because of sharp disagreements on a number of other issues.

The White House study's solution to the赤字 is to make the following:

do more foreign visitors to the U.S. In fact, a key recommendation of the study is that the industry should concentrate on an expansion of the commercial market and place less emphasis on the dwindling share of U.S. traffic in the present market (AW Sept. 30, p. 51).

The study will suggest that the use of foreign carriers cannot be increased in their services to the U.S. So far, the study will suggest, such decisions foreign nations have made to the U.S. and that reduce the market available to U.S. airlines.

An earlier White House study on aviation goals, Project Horizon (AW Sept. 14, 1961, p. 44) endorsed closely to the airline industry's position on the balance-of-payments issue. The need for continued U.S. pre-eminence in international air transportation, the study said:

"Our flag carriers should expand on a profitable basis, since our U.S. international air transportation system will play an important economic role in supporting our manufacturers of aircraft and related equipment, creating employment, dollar payments, and solving many other segments of the national economy."

There were no air week to allow the industry to use the first draft of the policy developed in the committee. The decision apparently came about in a short recall of what pressure on the committee.

Next month Federal Aviation Administration, N. E. Shultz, chairman of the strategic committee, will meet with the airlines to review the policy. However, the original 600-page study, which was prepared by Stevens Associates and Research Group and Battelle, New York Associates, will probably be reformed.

First draft was submitted by committee during the winter last year. The study, the draft will be reviewed in a special session in FAA, CAB, State Dept., Commerce Dept., Defense Dept., Agency for International Development, White House staff, and members of the Budget.

Meanwhile, the airlines are not alone on the side of the deficit. The U.S. has adopted an import tariff to have and hold to eliminate export-import deficits because of sharp disagreements on a number of other issues.

The policy can carry many ways. For Latin America, for example, could manipulate the policy so some carrier might want for its Pacific operation which, in

turn, could be at odds with the policy of another U.S. carrier in that area.

In a more specific situation, Pan American World Airways is vigorously opposed to a CAB staff proposal to ban the North Atlantic extension of Pan Am as a regional for TWA. On the other hand, Pan Am supports that principle, which is a basic recommendation in the White House study. These differences are evident for the airways, to not say not all policy subareas in all areas.

Aeroflot Passenger, Cargo Data Revealed

Moscow—Soviet Central Statistical Administration has for the first time included specific Soviet air transport data in an annual economic handbook, "The USSR in Figures."

The new information reveals a U.S. lead over Russia in air cargo as well as in passenger traffic.

Part one of the Soviet publication gives specific data for oil, gas, river, pipeline and automobile transportation. The figures on Russian air transport were only provided in terms of passenger gain over an unchanged 1950 base figure, which is a measure of capacity rather than load.

The Russian handbook considers the year published by Soviet transportation as that year on the number of passengers carried by Aeroflot 21.8 million in 1961, 16 million in 1960, 12.2 million in 1959, 8.2 million in 1958, and 400,000 in 1950.

The U.S. schedules airline industry handled 58,411,000 passengers in 1961.

Other Aeroflot traffic information includes:

■ Passenger-kilometers (thousand): 1961—16.4, 1960—12.1, 1959—9.1, 1958—6.5, 1951—4.1. U.S. scheduled airline industry flew over 40 billion passenger-kilometers in 1961.

■ Mail (thousand of tons): 1961—247.1, 1960—145.3, 1959—144.4, 1958—137.8, 1950—41.1.

■ Cargo (thousand of ton-kilometers, 2000 km per ton): 1961—801.8, 1960—582.3, 1959—450.5, 1958—393.4, 1949—113.2. U.S. scheduled airline industry flew about 1,779 million cargo and mail ton-kilometers in 1962.

"The USSR in Figures" continued to present Aeroflot's unduplicated route mileage in percentages of the 1949 total in 1961—214%, 1960—250%, 1959—247%, 1948—243%, 1949—180%

MOHAWK CHOOSES BAC ONE-ELEVEN



Mr. Robert E. Phaneuf,
President of Mohawk Airlines Inc., says:

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AIRLINE OBSERVER

► Questions of the extent to which U.S. airlines should be regulated under the Federal Aviation Act of 1958 again have been raised by a Civil Aeronautics Board chairman. Speaking at a recent Aviation Writers Association meeting (AWW Oct. 22, p. 14), CAB Chairman Alvin S. Boyd said that if the industry is to be wholly regulated, then the number of carriers operating it by rule at no regulation. If, on the other hand, competition is to be stressed, then merger may be in order. Previous Board members have found that the legal requirement for fostering competition within a regulated industry creates a dilemma.

► Strong de Havilland inter trade, including John Cunningham, chief test pilot and company director, was in Australia last week to push his Trident three-jet forward in competition with the Boeing 727. Potential customers are Australia and Trans-Australia Airlines. Major sales points are ability to deliver on time and an extensive after-sales service organization.

► Japanese Ministry of Transport has issued a White Paper on civil aviation, recommending that the government give rate assistance to Japan Air Lines to improve its competitive strength in international operations. It also called for a loosening of regulations for domestic airline route licensing.

► Eastern Air Lines has graduated 450 certified flight engineers since the program began last July (AWW July 30, p. 29). Good is 580 engineers, 100 more than the airline had when the flight engineers' strike began. At the present time, about 200 pilots are taking the 390-hour flight engineer course.

► W. A. Patterson, president of United Air Lines, says he is convinced that fees-age-free restricts the airline market. In a speech last week, he stated that "marketing may look impressive in airline advertising, but it makes no impression on fees."

► U.S. Travel Service reports a 30% increase in the number of French tourists visiting the U.S. during the first eight months of the year. Number of U.S. visitors to French borders increased from 12,140 in the 1961 eight-month period to 15,750 in the same period this year.

► Russia's single-engine An-2 biplanes are now arriving, 3,107 as of Aug. 30, in the Asian Republic of Mala. It is felt that the central link connects a total of 20 cities and towns. The Russians have trained Mala citizens to be mechanics aboard the An-2s, which are flown by Soviet pilots. Besides An-2s, An-4s have been imported, four-engine prop 30-18s, two-engine 30-14s and biplanes.

► Eastern Air Lines has blamed the industry's failure to adopt its new proposed tariff (AWW Oct. 15, p. 42) as the reason for withholding wage increases for the fall revision from the CAB. Provision for a 20% reduction on round-trip tickets during certain days of the week and proposed for a 4% increase in jet and night coach fares have been dropped. Request to reduce fares as the Air-Shuttle will stand unchanged, the airline said.

► New York, Atlanta, Newark 1073 are operating with transmission slots strengthened by shot peening, and there are more to be replaced by U.S. standards now designed for saturated life certificates by the Federal Aviation Agency. Metal also is working on a technique to reduce rotor blade noise in the aircraft, which Viasat believes is produced primarily by the noise blade tips when the front and rear rotor disk areas vibrate. Rotor blade noise is planned to increase durability, but New York Airways cannot spare any of its front shims in service for this modification now.

► FAA has received a survey that measures the noise generated by 28 nationally rated turboprop transports, turboprop freighters and turboprop helicopters at takeoff and landing. It will use this data, which was compiled for an upcoming consulting firm called Polytechnic, to update Planning Series No. 3. This document was issued to the Federal Housing Administration in 1950 to guide it in granting mortgage loans on property near airports. The new survey measures both the intensity of aircraft noise at takeoff and its frequency distribution in cycles per second, and could serve as the base for an FAA regulation prescribing maximum noise levels around U.S. airports.

SHORTLINES

► American Airlines will begin service at Dulles International Airport Dec. 1 with three jet flights daily, two nonstop round trips between Washington and Los Angeles and one round trip from Washington to Denver and San Francisco.

► International Air Transport Association's tenth public relations conference will be held in Washington Nov. 13-15. Total of 70 delegates and observers are scheduled to attend.

► Lake Central Airlines has filed a suit with the Civil Aeronautics Board which would permit foreign visitors to the U.S. to have unobstructed air travel on the carrier's system during a 30-day period for \$75. For children of such travelers, the price would be \$37.50, under the tariff, provided they are under 21.

► National Airlines has won an integrated award of flights from New York to Jacksonville and Tampa-St. Petersburg. One resulting daily flight will be operated to each of the Florida airports.

► Northwest Airlines will operate 70 jet flights weekly between Chicago and Miami beginning Dec. 15. It will also increase its flights a week between New York and Chicago and Hawaii to one daily.

► Sabena Belgian World Airlines flew a record 4,379 transatlantic passenger passengers in September, a 37% increase over the volume recorded in the same month last year. The carrier flew 56,170 passengers in September in the same month, a 17% increase.

► Seaboard World Airlines has reported a net profit of \$382,000 for the month of August on revenues holding \$2.6 million. For the first eight months of 1962, the airline showed a \$63,400 net loss.

► TABSO, Bulgaria's state-owned airline, reported its route network totalled 3,533 mi. as the carrier's 1961 15th anniversary. Included are 840 mi. of domestic and 2,693 mi. of international routes.

► Trans World Airlines has announced its application to the International Airports Association to include Louisville in an additional city to be served by the airline if the CAB adopts a policy of integral competition for U.S. international en-



Mike Stevens and Dennis Dan are senior marshals recently by Trans World Airlines. (AP)

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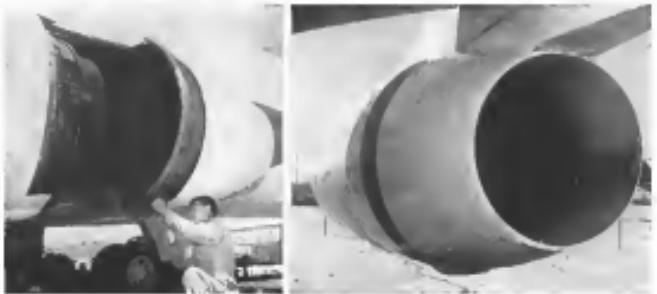
Convair 990A freighter transport has new wing fllet (arrow), nacelle extensions, wing center change and full-size Krueger flap to improve speed and short field characteristics. Changes were made under agreements reached with Swanson and American Airlines to bring the 990 up to original performance parameters (AW Sept. 18, 1961, p. 96; Sept. 25, 1962, p. 35; Oct. 9, 1962, p. 45-46).

Convair 990A Has Wing, Flap, Nacelle Changes

Full length Krueger flaps replace the former combination of Krueger flaps and leading edge slats. Wing leading edge has been modified so that it has less camber. Convairized aircraft shown here shows wing changes designed for Swanson and has been certificated by FAA. Another version, for American but basically the same, will begin certification testing in November (AW Oct. 21, p. 96).



Engine pods have been extended forward 21 in. to eliminate drag which prevented original 990 from meeting performance guarantees. Convair changes have been added to the 990A engine pylons and internal fairings on the inboard side of each engine nacelle. Both of which are applications of aerodynamics design principles. Two photos above, below left show nacelle open with thrust reverser close shelf visible. Nacelle below right is in normal flight position. Convair has flown 990A about 125 hr.



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0.0-1.00	F	1,000	7600	0.0-100.00	0.01	2,395	2000
0.0-10.00	F	1,000	7670	(option 10-100.00)			
0.0-10.00	R	1,000	7680	0.0-100.00	0.01	3,395	7000
0.0-10.00	R	1,000	7690	0.0-100.00	0.01	3,395	7000
0.0-1.00	R	1,000	7700	0.0-100.00	0.01	3,395	7000

F = Frequency

R = Frequency Ratio

0.0 = Time Interval Measurements

NCT = Universal Counter-Clock

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elsewhere in North America. For instance, Bafford came from NASA Space and Information Systems Division while Lippmann came from corporate headquarters.

The division's responsibilities include areas of management detail which include cost control, quality control, a management division which oversees President John R. Moore, strength, fleet management, these & adequate control is to be exercised.

For example, the Maintenance Division is responsible for running both of reported components which the final act division engineers are allowed to use.

It standardizes the dimensions of pointed aircraft bombs used in all subsystems, establishes parts interchange standards to assure that the same drawings are used by all designs working on the aircraft.

In the future, certain major repair

units

will be introduced according to Bafford. For example, the guidance division purchasing agent units will be purchased over long ordering, non-purchased parts will be given specific authorization from the Maintenance Division. Also, drawings can now be released for production without its approval.

Bafford considers that this can of aircraft does not breed popularity. But he is quick to say these standards are accepted by the operating divisions as necessary to achieve overall program objectives.

The division also does a small amount of in-house design of special airborne instrumentation required for flight tests or special checklist equipment needed for engineering tests. But the manufacture of such equipment is



412L Search Radar Delivered to USAF

From AN/FPS-22 Infrared long-range search radar for use with 412L weapon control system has been delivered by Walthampton Defense Center's Electronic Division to Strategic Air Command, AFM, N.C. Radar units are an advanced "production" edition and refined software. This permits it to be disassembled and transported in five trucks of size shown. Radar can be set up and put into operation within six hours. Walthampton says.

advantages of the other participating product divisions. But to the Air Force, the Maintenance Division is the status negotiator and speaks for Autometrics on the program according to C. P. Bafford, chief engineer.

The division works with the Air Force to establish overall system specifications, then in turn prepares specifications for all major sub-systems on which the product division works. The Maintenance Division prepares the overall plan of new programs, prepares justifications, certifies change requests, establishes and approves schedules, and handles

Each in the program, the Maintenance Division purchases all high reliability components, inspects and assembled them in pointed aircraft bombs which in turn went to the product division for insertion in their equipment. This was done prior to flight certification for all components and sub-systems. Once the program was started, but had not yet started, this function was turned over to the Computer and Data Systems Division, which now performs the same function for both itself and the Interim Navigation Division on the Maintenance program.

Additionally, the Maintenance Division conducts initial engineering and first tests to assure that specifications are being met in the Autometrics plant at the Atlantic and Pacific Missile Range and at the missile sites.



TV Camera Used in Towed Target Tests

Closed-circuit television camera has been mounted on a GECO Metras TT20 jet to monitor performance of Del Mar towed target system during testing last week was at Royal Aircraft Establishment, Farnborough, Down, England. Camera was, manufactured by BMH Electronics, Ltd., is mounted off the cockpit canopy and is powered by 12-v. battery. Receiver is mounted in front of the canopy, who also operates the target switch.

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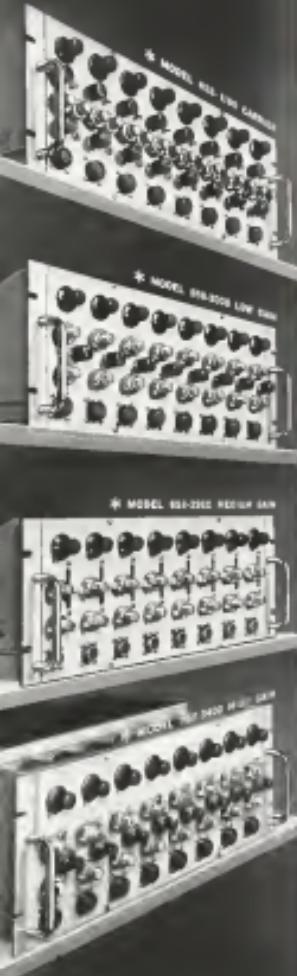
Versatility—Witness the capability of C-124s stopping "Dew Line" stations and making nonstop drops at the South Pole; the C-133 trans-

porting ICBMs while carrying freight in bigger chunks than any other aircraft—the magnificent performance of C-47s flying "the hump" during World War II; the remarkable durability of C-54s and C-119s during the Berlin airtight. And take note that the new DC-8F "Jet Trader" can be converted to any of 12 configurations in less than 2 hours.

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One of the greatest potential advantages of a digital computer over the analog type used for guidance is early failure detection. This is particularly true in hostile or severe environments where the computer must be able to handle a series of different problems. But little has been made of this inherent security in ICBMs prior to Minuteman, except to permit rapid change of targets by changing stored computer program constants.

While the guidance computer plays a relatively important mission role, in general, ballistic missiles this role has been a brief one lasting only during two or three minutes of powered flight plus brief periods of operation on the ground when the computer was undergoing checkout.

Profound Testing

To perform profound testing of the missile's guidance and flight control systems, previous ICBMs have required separate ground-based equipment. This equipment, usually digital in operation, also had an important but brief role which ended when the missile was launched.

In the design of the Bland Dog missile to reduce weight, Contractors first tried the idea of designing the missile's guidance computer so it could be tested and checked "on board" the missile to test the overall guidance system prior to launch.

This same concept has been applied to the Minuteman, with several important advantages. The cost and complexity of the site equipment is greatly reduced. The missile-borne computer is inherently exercised, without additional effort or operational time. The time it takes to prove compatibility has slipped through the ribbons of reliability testing. It is far better that it pushes a missile before during preflight than during actual missile trials prior to missile launch.

To provide the added reliability, the computer must be able to monitor its own operation, and perform the required tests and validate the flight programs. After launch, the computer monitors modal and carries out major two calculations.

Computer Functions

While previous ICBMs have required a separate signal conditioner to convert guidance computer signals into a form suitable for operating the flight control system, this function also is built into the Minuteman computer, making it a triple-function device.

The computer determines when staging should occur, and sends control commands and status data to the computer in the next stage which will be cut free for the aircraft to hit the intended target, according to Dr. W. L. Morris, computer project engineer.

When the Minuteman is switched into the site, the computer takes over the top job of system checks. One of which it conducts continuously when the missile is on its normal alert status (ready



Position Display for General Aviation Aircraft

Position display for general aviation aircraft, called Pifot 2, gives pilot continuous information on aircraft position with respect to selected azimuthal chart. New display set for \$1,250, measures 9 x 7 x 21 in., and weighs 7.1 lb., including remote transmissor unit, package measuring 3 x 6 x 4 in. Power consumption is 15 watts at 28 vdc, or 3 watts at 14 vdc. Display obtains signals from aircraft's compass (VOR) and distance measuring (DMR) receivers. Manufactured: ACP Electronics Division, ACP Industries, Passaic, N.J.

onboard lighting and calibrators. Finally, at launch time it performs the entire function test and initiates the flight programs. After launch, the computer monitors modal and carries out major two calculations.

Profoundly, a more robust quantitative check is conducted by the computer which includes measurements to determine how well each element is operating and whether there has been any degradation in performance. For example, when the routine check-out switch introduces a signal into the flight control amplifier to determine that each nozzle actuator moves in the proper direction, the periodic quantitative test measures the response time of the actuators in seconds.

During this checkout, the computer also independently recombines elements such as gyro's or accelerometers which might have drifted slightly since the last check. The results of all measurements are printed out for subsequent analysis. Because the computer of the Minuteman performs the checkout, it is necessary to provide using external means to



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Memphis Techniques Memphis-Keeler believes that this and an anisotropic-conductivity technique for anisotropic acceptance may one day compete. He says the two techniques to take advantage of the inherent advantages of each (AW Mar 19, p. 55). One reason in the wind is the fact that Fairchild Semiconductor Division, a pioneer in anisotropic-conductivity technology, now is seeking this film technique with the objective of combining both techniques. **Titan Instruments** and **Wrightson Electronics**, both of which have anisotropic-conductivity programs, also have in-house **Silicon** and **Siliconix** Electronic, which has performed in this field so competently, will announce optical anisotropic-conductivity techniques with operating speeds far above anything now on the market. Methods is another firm with strong capabilities in both techniques.

► Fewer IRE Conventions—Number of technical conventions sponsored or co-sponsored by Institute of Radio Engineers during the next six months totals 26, a decrease of about 15% from the number of sponsored during the most recent period two years ago.

→ **RADC Test Angular Diversity**—like previous attempts to determine the possible advantage of using angular diversity to obtain more reliable multiple user communications are made at the **RADC Test Development Center**. This measure involved search of a 25 ft. dia. parabolic reflector antenna using seven feed horns, each powered by its own transceiver, which produce seven beams, each operating at a slightly different angle. Receiving for all seven beams at a single receiver, the system was able to simultaneously select reference, each with seven feed horns and using separate parametric amplifiers. Equipment was developed by **ITT Federal Laboratories**.

► **Monolithic Factory Planned**—Westinghouse Electric will build a 90,000-sq-ft facility near Baltimore to manufacture monolithic semiconductor microcircuits, with operation scheduled to begin in the spring of 1965. Activities formerly carried on at the Air Arm Division and the Semiconductor Dept. in Youngwood, Pa., will be consolidated at the new facility. Employment initially is expected to total several hundred.

• NEL Develops Ultraviolet Encapsulated Research Laboratory sound six report they have achieved laser emission at a wavelength of 3,125 angstroms from gallium-constituted plasma dis-



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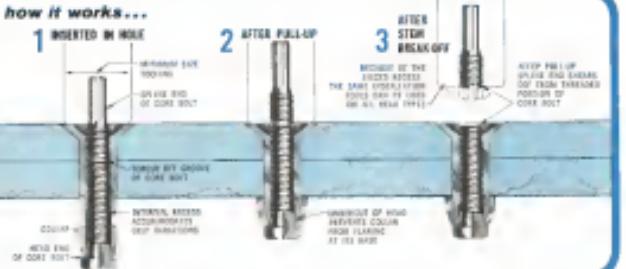
Three lead styles are offered: an AN308 style to permit direct substitution with similar headed blind fasteners, a compact fastener for use in thin gauge material and a fastening style designed for maximum precision. Normal shank diameters range from .52 thru .58 while a unique coverage 1.64 series is also available. Grip lengths are 1.16 increments with an additional built-in 1.32 grip for unexpected variations in work thickness. Beta Bolts are offered at a low cost (\$10,000-200,000 per

hundred) and A-256 configurations. Other Beta Bolt series are 2025-T6 aluminum alloy, titanium and other aerospace aircraft and strength alloy are nearing the production stage.

Sample Adapter and Torque Driver tooling when combined 6 and fitted straight and 90° standard power screwdrivers, engage the unique shank areas to install the Beta Bolt with a considerably less initial lead torque by the operator than normally required to install conventional stressed fasteners. *Please for our free brochure describing the Beta Bolt's unique strength characteristics, how it works and the installation methods used.*

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how it works...



the same heat material previously used with other fasteners to obtain erosion in the aircraft species. New laser, operating at 1000 degrees centigrade, gives 15 megabars static pressure and a 15 megabars static temperature resistance which peaks at 3,125°K.

► AFCLR Captures Lightning Strikes—Air Force Cambridge Research Laboratory has successfully "captured" two lightning strikes by launching them down 1,900 ft. It was made aloft by a step-launched rocket during a spell in the Caribbean. Each of the two lightning strikes vaporized the wires, but not before AFCLR scientists made measurements indicating they had generated current of 30,000 amperes. The experiments are part of a program to learn more about the effects of lightning strikes on aircraft and to investigate possible use of the ionized path produced by the impact and use to serve as an antenna for VLF signals.

► USSR: Uses "Kale-Edge." Electro-Soviet Union reports that it has developed and successfully put into practice the basic idea for the generation of ultra short radio waves in microwave. It has been confirmed that radio waves, coming into contact with the tops of waveguides, turn around them. This makes it possible in certain microwave spots, without expensive attenuating structures, to generate strong radio and television broadcasts. The technique has been "successfully and economically exploited in a wide network of mountains radio stations," the USSR reports. The Soviets are not clear whether this is close to having discovered the principle which has been widely known for some time in the U.S. as the "kale-edge effect." It was commercially investigated several years ago by the National Bureau of Standards, which subsequently reported its findings.

► Call for Nominations—Proprietary authors who would like to present papers at the 1963 National Aerospace Engineering Conference, November 11-13, in Detroit, Mich. 31,115 words and subject. The word abstract and biographical data by Dec. 1 to Dr. Walter L. Koerth, 1379 Teller Drive, Teller Springs, Colo.

► Signals on the Dotted Line—Major contract awards mostly announced by defense manufacturers include the following:

- Ford Motor Company's Aerospace Division, Newport Beach, Calif.—Air Force contract to investigate optimum methods for digitizing battle damage information, sponsored by Air Force Development Center.
- Maran Electronics Corp., New York

City—\$174,447 contract to develop components. These status growth transistors incorporating feedback techniques to improve performance, from the Federal Aviation Agency.

- General Electric, Technical Aviation Planning Operations (Tampa), Santa Barbara, Calif.—\$2,345 contract from AF Electronics Systems Division for studies on information processing in command and control.
- Lear Siegler, Inc., Instrument Division, Grand Rapids, Mich.—\$125,510 for resistance strain gage indicator system for use on F-105, from USAF's Aerospace Systems Division.

- National Cash Register Co., Dayton—\$90,083 contract from Aerospace Systems Division for synthesis and evaluation of various speech recognition techniques, in cooperation with Digital Voice Communication Laboratory of AF Cambridge Research Laboratories.
- General Precision, Inc., Link Division, Binghamton, N.Y.—for a "frequency goniometer" as electro-optical instrument capable of measuring angle to within 0.1 second of arc, equivalent to being able to aim a nuclear bomb within a yard of a target at a distance of 1,000 m. Contract is from NASA's Marshall Space Flight Center.

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Large Graphite Nozzle Cylinders Formed

By Donald E. Fink

New York—Four graphite cylinders, large enough to fit into nozzle lines for National Aeronautics and Space Administration's proposed 200-m solid rocket motor, have been fabricated by Union Carbide Corp.'s National Carbon Division.

Cylinders will measure 303 in. in outside diameter, 34 in. in inside diameter and 70 in. long when they complete the cool-down phase of the 12-week fabrication cycle at Novosibirsk.

New facilities, recently installed at National Carbon's Niagara Falls, N. Y., plant during a \$6-million expansion and modernization program, were used to fabricate the cylinders, which the company says are the largest graphite pieces ever formed.

Possibility Study

Fabrication is the second phase of a three-phase feasibility study sponsored by a contract from Rocket Research Laboratories of USAMF Systems Command's Space Systems Division. Contract will be let for three cylinders, but a fourth is being fabricated as a spare.

First phase of the program called for modification of space production facilities to handle the large cylinders. The third phase will involve destruction testing of at least two of the cylinders to determine their properties. Also under phase three, the feasibility of using xerographic and thermographic techniques for nondestructive structural testing of such large pieces will be investigated.

While the primary purpose of the program is first to determine the feasibility of molding graphite in large pieces and then to test in qualitatively, E. N. Townsend, manager of aerospace products for Union Carbide, said the 303-in. cylinders are large enough to form nozzle liners for the 360-in. motor NASA wants developed (AW Sept. 17, p. 171).

Nozzle diameters for the big booster will run from about 120 in. to about 150 in. on each chamber, depending on motor design, said Townsend and Thelwell and Kerec General, leading contractors in the 200-in. motor project. Both have and the 103-in. size could be adapted to a test motor.

Two of the cylinders will be used for destruction, but the third and possibly the fourth will be available for the final nozzle forming process. This will involve machining the inside of the walls to form a throat section. The

inside would be a smooth, uncoated nozzle body of knit and coarse reticulate graphite. The last then would be coated in a plate or shell manner to form the complete nozzle assembly.

The cylinders are made of grade GFW impregnated graphite, which has a density of about 1.4 lb/in.³. It contains 45% carbon and is manufactured from grade GFW and treated with large solid stones. According to Townsend, the test lasers showed a slow rate of exothermic exposure to temperatures in the 5,000° to 6,000°F range for periods up to 120 sec.

Production of the 103-in. cylinders required a major expansion of standard graphite production processes. Steel molds, 304-in. dia., with 32-in. dia. cavities, had to be built. The green carbon shell pieces measured 103 in. in outside diameter, 32 in. inside diameter and 37 in. long. During the baking and graphitizing process, however, the cylinders shrink and expand several times. The completed cylinders,

therefore, are expected to meet exact specification.

Initial diameter of the cylinders was chosen as an arbitrary figure. Townsend said, "A solid core could have been used, but the hole in the center makes it easier to handle the 40,000-lb. pieces." It also provides a starting point for the throat machining process.

Thread Forming

Tensioned steel graphite's machinability, comparable with that of wood-wool or fibreglass, will make the throat forming process relatively simple. Thread diameter may be as large as 96 to 128 in., depending on the inside diameter of the nozzle and the throat volume desired.

Cylinders could have been molded with inside diameters closer to the final desired throat diameter, he said, but the threat that cylinders are easier to mold and handle. Material cost is the only thing is not a significant factor in the overall cost.

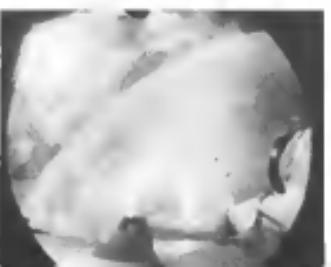
Most large boring mills could tool to



Wide-Angle Camera Records

Atlas Booster Separation

Wide-angle camera, mounted externally on an Atlas missile launched recently from the Atlantic Missile Range, photographed a 200-mi. view of the craft's curvature. Booster, foreground, is shown just prior to separation. Booster left nozzle and flame from full-color camera are visible at bottom. Separation is completed bottom right; white smoke engine cut-off fire. White dots (upper left) are reflections on quartz glass through which photo was taken. Center right, it parted from Atlas at flight just a few thousand feet. The wide-angle camera is being used to determine the best way to separate.



GREEN CARBON CYLINDER, measuring 103 in. outside diameter, as shown in National Carbon Co.'s new kiln oven. Finished graphite cylinders will measure about 303 in.

U.S.A.F. F-104 WINS AIR FORCE FIGHTER WEAPONS MEET

The Tactical Air Command has a new champion. In a world-wide competition among TAC fighters, the F-104 Starfighter earned off top honors in the William Tell A.F. Fighter Weapons Meet at Nellis Air Force Base, Nevada.

The F-104 pilot, Captain Charles E. Tofferi, of the 479th Tactical Fighter Wing, cinched his victory with 3 perfect scores in such vital events as strafing, air-to-ground rockets, and napalm drops. In the single air-to-air event, he set a new record, completely destroying his target in 63 seconds. His winning total for all events was 19,018 points—out of a possible 24,000.

Captain Tofferi's brilliant performance

proved what the F-104 can do. F-104 pilots all over the world know the *F-104 is a most effective all-around fighter*. It meets the TAC mission of close ground support and interdiction, with the same mastery it shows in air superiority missions.

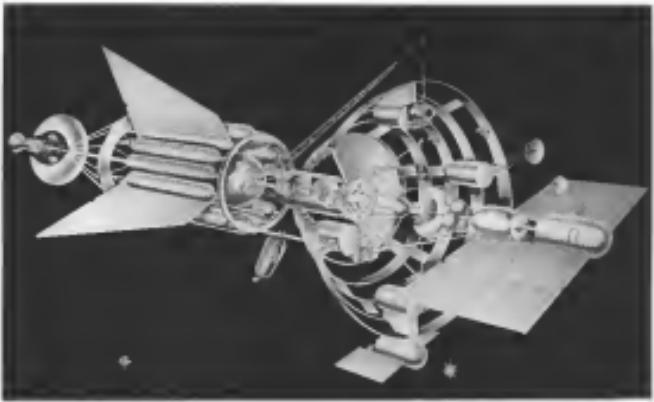
The Lockheed F-104 is not so much a single weapon as an extremely stable platform which can adept itself to almost any fighter weapons mission. Six of our allies chose the F-104 over every other jet in the world. It is now being produced in 7 nations for 11 air forces, including the U.S.

Captain Tofferi has demonstrated once again the reasons for this overwhelming vote of confidence.



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Maintenance Station Envisioned for Nuclear-Powered Spacecraft

Vehicle of the type shown in this artist's concept was imagined recently by Wright-Patterson Electric Corp.'s aerospace laboratory as a permanent maintenance, repair and refueling center for nuclear-powered spacecraft. Concept shows self-propelled repair shop that refuels equipment (right). Shielded personnel quarters are in the center, and the maintenance station's propulsive system is at left.

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PRODUCTION BRIEFING

Altispower, Inc., Newport Beach, Calif., is designing solar panels for possible use in solid electric-propulsion modules in satellites or space vehicles. Fuel cells. Work is financed by a \$65,000 National Aerospace and Space Administration contract. Altis, continuing an electric-oxide mode of a research on the necessary development between two thin metallic layers, is expected to operate in many kinds of heat and pressure under zero gravity conditions.

Low Single, Inc., has received a \$750,000 subcontract from Curtiss-Wright Corp. to produce rocket case sections for the first stage of the Mantis ICBM. Work will be done at the Astro Structures Division, El Segundo, Calif., on spin-forging equipment.

Douglas Aircraft Co.'s Missile and Space Technology Division has received a contract approximating \$55 million for continued research and development of Avco's Nike Zeus anti-ballistic missile. The contract represents Douglas' portion of a \$150-million Avco contractor study awarded to Western Electric Co. prior. Zeus contractor (AW Oct. 5, p. 48).

Ames Research Center's Aerospace Division, Mountain View, Calif., has received a \$1.5-million contract from McDonnell Aircraft Corp. to build hydrazine propellant for the F-104 Air Force's version of the PBIR Phantoms jet.

Dishfield, Inc., Canton, Ohio, will build flight instruments for joint entry hatch and protection system for the Apollo space capsule at Massachusetts ICBM underground branching site. Work is financed by a Boeing Co. contract for approximately \$1.7 million.

Kelvin Electric Co., Van Nuys, Calif., will produce precision wirewound resistors for use in the Convair Interplanetary Spacecraft. Work is financed by a contract from International Business Machines Corp.

Hughes Aircraft Co., Culver City, Calif., has been awarded a supplemental contract for \$1.7 million to continue development of the CAR 9 Falcon missile system.

Krasin Aircraft Corp., Bloomsfield, Conn., has purchased Power Transmission Systems, North Caldwell, N.J., which specializes in production of gear

and power transmission for aircraft. Purchase was made with cash and Krasin stock.

Brown University will conduct research in reentry physics under a \$156,000 contract awarded by the Advanced Research Projects Agency and the Office of Naval Research. Purpose of the research is to help in the development of knowledge of ICBM reentry and tracking devices which will discriminate between debris and orbital warheads. Solutions of the engineering problems of detection systems will not be attempted, but physical phenomena basic to such systems will be investigated both theoretically and experimentally.

Telecomputing Corp.'s Power Sources Division, Los Angeles, Calif., has been awarded an Air Force contract to develop and produce secondary activated, aerospace primary batteries to supply auxiliary electrical power for portable safety systems in space vehicles. Batteries are designed to operate in 25 sec. and operate in temperatures from -35° to 150°.

Douglas Aircraft Co.'s Diesel W. Douglas Engineering and Product Development Center has been officially dedicated at Long Beach, Calif. The research and development facility has 65,000 sq. feet of floor space and a helipad on the roof. The facility's administration building is nearing completion.

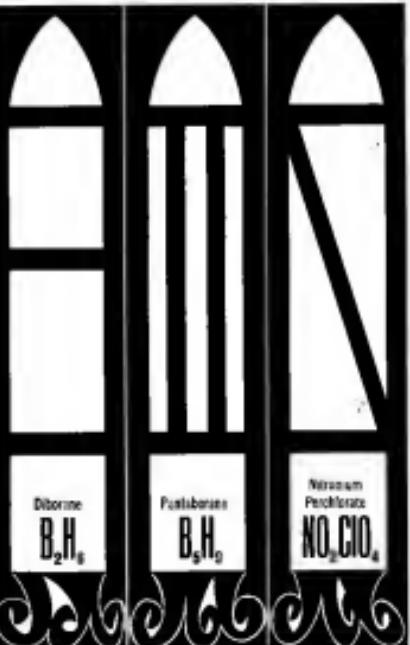
Nebraska's extension of the Atomic Energy Commission's National Aerospace and Space Administration Space Nuclear Propulsion Office has been opened in Las Vegas with Robert P. Higgins as chief.

Bureau of Naval Weapons has initiated development study contract in Springfield, Ohio, for a solid-dynamic anti-submarine weapon system. The system will be a 1.5-kilowatt proton-kinetic-wheel, which is developing a 15-kilowatt solid-dynamic system for the Air Force using liquid-cooled metal at working fluid. This will use a low-temperature regional uranium as working fluid in the Navy system.

Avco Corp. of England has awarded an \$83,500,000 contract to Marconi-Kawasaki Co., Inc., of Bayside, N.Y., and four associated contractors for construction of underground launch facilities for the 200-kilometer ICBM system. Work at AFRL, Cheyenne, Wyo., is scheduled to begin January 1970 and completed in 1972. The 200-kilometer ICBM system will be ready next October and the entire system will be finished in September 1984.

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Automatic temperature control GSE for Titan II missile propellant

This new environment-control package was designed and produced by Hamilton Standard for the Air Force's Titan II missile, made by Martin. It automatically stabilizes propellant temperature at 60 ± 5°F within a 20,000-gallon storage vessel. The unit electrically heats or mechanically cools a glycol and water heat transfer liquid, then circulates it to the storage vessel heat exchanger. It is built to perform reliably in ambient temperatures of -55° to +115°F, and from sea level to 6,000 feet.

The Titan II Propellant Temperature Controller is evidence of Hamilton Standard's ability to meet

environment-control GSE assignments. It typifies the results attainable when engineering capabilities in pneumatics, hydraulics, electronics, and packaging are combined with specialized manufacturing skills.

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FINANCIAL

New Offerings

Control Data Corp., Minneapolis, Minn., engaged in the design, development and manufacture of systems, equipment and components and in electronic data processing and automatic control for military, scientific and industrial uses. Offering a \$15,000,000 of convertible subordinated debentures, due 1977. The proceeds of the debentures will be used in part to pay outstanding bank loans.

Tetra, Inc., Providence, R. I., a multi-industry manufacturing concern with an array of products, grants a refundable defense offering of \$10,000,000 authorized by the Board of Directors by Howard Kellogg and David K. Neale, as trustee of a certain trust.

American Brake Shoe Co., New York, N. Y., principally engaged in the manufacture of components, machinery and equipment for the manufacturing and transportation industries. Offering a \$11,000,000 of subordinated debentures, due 1987. Proceeds will be used for general corporate purposes, including capital improvements estimated at \$750,000 to 1982.

General Automation, Inc., Cincinnati, Ohio, engaged in the development of, and has arranged for the manufacture of, equipment for general industrial use of all kinds; it has developed two fast-break relays for each cause used for automation and military use. Some 200 engineers, the company has recently engaged in development of an electronic microprocessor to be used in aircraft and missile applications. Headquartered in Waukegan, Ill., the company, \$10,000,000 capital stock, \$10,000 shares by the company, and \$10,000 outstanding shares by the holder. Of the company's personal, \$115,000 will be used to pay certain costs and account payable, \$110,000 for corporate expenses for use over the coming 12 months by Waukegan and its personnel, \$10,000 in drugs and product needs of the equipment for jet aircraft ground equipment, the balance of the proceeds for corporate use to Waukegan and for general corporate purposes.

Siltron Devices, Inc., Natick, N. J., engaged in the design, development and manufacture of semiconductor components consisting of silicon rectifiers and integrated components of silicon dioxide and in dielectric form. Offering a \$1,250,000 convertible common share by the holder.



LOW-AMP 3-PHASE CIRCUIT BREAKER RESISTS 500 CPS VIBRATION AT 10 G!

This compact package integrates three miniature push-pull circuit breakers in a single 3-phase protection to electronic components and cables in the 10 to 10 amp range. An overload on any one phase trips all three breakers—and releases the single indicating button. When the button trips on, everything's "A-OK".

Tripping response is comparable with the speed of a slow-blow fuse... 2 to 20 sec at 200% rating. Since the KLIXON 1276 circuit breaker is thermally responsive, it avoids nuisance trips on harmless current transients.

For complete performance and test data on the new KLIXON 1276 3-phase circuit breaker, write for Bulletin CIRB-27.

PERFORMANCE CHARACTERISTICS

Breaker ratings	1000 milli-ampères
Breaker trip current	100 milli-ampères
Breaker trip voltage	100 milli-volts, 100 milli-amps
Breaker trip time	20 sec to 200 sec
Breaker trip temperature	At 150° total 10° and at 100° rating
Breaker trip current	At 100° 2.5 times
Breaker trip voltage	100 milli-volts
Breaker trip time	200 milli-sec at 200% rating
Breaker trip current	800 milli-amps at 100% rating
Breaker trip voltage	200 milli-volts at 100% rating
Breaker trip time	200 milli-sec at 100% rating



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SMALL AIRCRAFT ENGINE DEPARTMENT

GENERAL  **GE** ELECTRIC
FLIGHT PROPULSION DIVISION



The 370 pound 8.6 x 10.6 x 10.6 ft. stainless steel vacuum chamber being tested in unique space environmental testing at NASA's Goddard Space Flight Center.

The Goddard "6 by 8" (8 ft. in diameter and 8 ft. long) horizontal test chamber is one of the key elements in the reliability testing program at NASA's Goddard Space Flight Center, Greenbelt, Maryland.

This Stokes-designed and Stokes-built Gamma-vacuum unit was the first test space simulation chamber available at Goddard for testing unpressurized vehicles under the harshest possible range of environmental conditions, and is the largest presently in use there. It has a vacuum capability of 1×10^{-7} Torr (200 miles altitude) under full load conditions, and is equipped with a heat transfer system capable of handling millions of wall temperatures from -65°C to 100°C .

Goddard's "6 by 8" will continue to serve as the test chamber for the Space Flight Center's highly advanced space technology laboratory until the massive test cell currently being constructed nears completion and is in service early in 1963. Major space test capabilities of this facility, which is expected to set the most advanced standards for spacecraft checkout, are five 30 ft. diameter, 60 ft. high Gamma-vacuum environmental simulators. Stokes was selected as a prime contractor to NASA for complete vacuum and cryogenic systems for these huge chambers.

We welcome your inquiries regarding our capabilities and facilities for designing, fabricating, and testing vacuum test facilities with the advance of the state-of-the-art, on any portion of a simulation program requiring high-vacuum and cryogenic systems. Space Systems Department, F. J. Stokes Corporation, 5500 Tibor Road, Philadelphia 28, Pa.

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MANAGEMENT

New Yorkers Protest Defense Work Decline

Washington—New York congressional delegations have urged the Defense Dept. to cooperate with the White House's Office of Emergency Planning on a program of dispersing military production and research and development facilities.

In a letter to Defense Secretary Robert S. McNamara, the delegation, headed by Rep. Emanuel Celler (D-N.Y.), pointed out that Edward A. McCormick, OEP director, has expressed concern over "hollow cities" in metropolitan planning and the concentration of defense industries. McNamara was asked for a report as to "whether some mechanism to bring investigation at the highest levels to a reasonable and expeditious conclusion is in order."

The New York generated a decline of over 10% in fiscal 1962, from fiscal 1961, in the proportion of Defense Dept. business that went to prime contractors in their state. Awards to California increased over 37%, giving the state 26% of the total Defense Dept. business for fiscal 1962. New York's share of the total was 13.7%.

"We cannot let the leadership missing of procurement action on one program area cause us to ultimate benefit by another," the congressional group wrote. "Concurrently, faced with the challenges this country faces, there should be ever close consideration of deployment compatible with the national interest as the widest possible base."

Government-Industry Changes Are Requested

San Antonio, Tex.—New concepts of government-industry relationships are being considered by the operators of U.S. technical resources, a birthplace of the future. Lockheed senior vice president Richard E. Hansen stated this during USAF's Annual Strategic and Engineering Forum.

Stating that "we have long realized the utility of government subsidization in the defense industry," Hansen noted that today the defense industry has grown into one of the largest segments of the total U.S. economy and the need for this kind of government support no longer exists. He said the continuation of government subsidies is both undesirable and inefficient on both sides.

Hansen pointed out that defense companies today spend an average of 4% of total sales on technical research, including R&D and proposed advocacy.

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New Power Systems Take Shape at Curtiss-Wright

What you see to the left are three ancestors shaped with a common purpose: putting power to work. More power—more efficiently, by means of new transmission systems developed by the Wright Aeronautical Division for a variety of land-and-air equipment.

Under contract with the Bureau of Ships, a new transmission system is now being developed which will handle inputs of 40,000 HP for near-future use aboard 500-ton hydrofoil craft. As a major producer of precision gears and gear systems, Wright Aeronautical has received aircraft sub-contract for the design-and-production of a new angle drive mechanism that increases electrical capacity by as much as 30%.

Torsional-traction drives offer power transmission

with a smooth, infinitely-variable speed change—for military and industrial equipment—with a new order of fuel economy, overall efficiency, and grade-acceleration performance. Torsional drives are lightweight, quiet, and practically free of vibration. Evaluation contracts have been placed by the US Army and the Link-Belt Company.

For industrial pumps and for both military and commercial water craft, an advanced water jet propulsion system—unique in design-simplicity and rugged in construction—offers a most efficient means of propulsion.

These systems are the result of generations of experience at Curtiss-Wright in power transmission. They can mean more power to you and your power transmission programs. Our literature is available on request. Write for it.



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**PUMP
PRIMERS**
ARNE A. NICHOLS

**High Altitude
Pumping Efficiency**

Engineers concerned with the pumping of various aviation fluids have learned that the best pump for good performance at high altitude where low inlet pressures are encountered. Pumps which work well at low altitude frequently can be expected to do the same at high altitude when they experience the rapid pressure changes, shock and turbulence which promote foaming and lowered efficiency of high altitude.

Generator
pumps are often
used at high
altitudes.
The following
describes
specifically
the
generator
pump.
A specialized
form of pump
and gear pump,
the generator
pump has an
integral
generator
and
is a self
driven, self-started, element. The
generator has one less teeth than
the outer and the missing tooth space
serves as a slot for trapping the
shaft from the rotating stator. The
drive gear is mounted on the stator shaft.
Since operation and storage of the
generator at 10,000 ft increases the large
heat and discharge parts results in
increased pump efficiency and
minimum change in fluid. Turbulence
which is often types of pumps, occurs
in the generator pump offering
exceptionally good performance at
high altitude.

For relatively speed and density load
stresses between the two extreme
extreme mean high performance
efficiency is demanded. ♦

For the best performance and
lowest susceptibility to noise and
geometry of housing structure make
generator pump used for greater
noise reduction.

Engineers concerned with driven,
auxiliary power sources, gear drives
and fluid transmission design problems
have found. For example, the following
have found generator type pumps ex-
tremely useful in their attempts to
hold down and achieve maximum
operating reliability with high service
reliability.

Applications for generator pumps
range from 1000 ft of pressure up
to 10,000 ft. The pump can be used
for primary hydraulic and servo systems,
hydraulic motors, tube annealing and
heat treatment, aircraft fuel and solvent
pumping, aircraft and ground cali-
bration, and similar applications.

Technical data is available and your
inquiry is invited. Writer

W. H. NICHOLS CO.

Makers of Smith Mekins Pumps
and the Nichols Millett Blowers
"The Miller that uses its heart."

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AERONAUTICAL ENGINEERING



BEDE AIRCRAFT BD-7 aircraft shown is built along same general lines as earlier XB-02 experimental STOL aircraft. Airliner version has modified CT58 engines, during a single propeller mounted inside an nacelle ring. Capacity is 24 persons.

Bede Aircraft Reveals First Design Details of Proposed BD-7 Airliner

First design details of the proposed Bede Aircraft BD-7 *short-haul* airliner, shown to be built around the major aerodynamic features of the company's experimental STOL aircraft, the XB-02 (AW, Feb. 18, p. 6).

Large-diameter plus suction boundary-layer control on the upper surface of the wing give predicted maximum lift coefficients which should allow takeoff and landing speeds of 55 mph.

Part of General Electric CT58 turboprop engines used at 1,450 rpm, each, are coupled in drive a single propeller mounted on an annular nacelle at the top.

Basic configuration has 15 seats in the cabin. At the aircraft normal gross weight of 10,300 lb., internal fuel provides a 1,440-mi. range with a 45-min. fuel reserve, according to the airframe. In a high-density mission, when 28 passengers and luggage are carried for the same gross weight, the range is reduced to 385 mi., with the same reserve.

Computers are now working on a detailed air analysis of operation with the BD-7, using methods of Dr. T. C. Tsoi, post-AIAA member. Calculations are being completed for carrying 24 passengers. On this basis, the computer reports the net post-sea-level elevation to be 35.5 hours from comparable figure for the Douglas DC-3. Cost per passenger-mile is estimated at 51% lower than the DC-3 cost.

Normal 15-passenger arrangement at

the interior seat seats in rows of three spaced at 45 in. pitch. This is reduced to a 36-in. pitch for the high-density mission. Baggage compartment volume is 112 cu. ft.

Boeing proposes an all-aisle version along with the passenger-carrying ED-7. It would have a typical seat 32 in. x 68 in. to give more room to the cargo volume of 1,136 cu. ft.

Fact load is 472 cu. ft., carried entirely in the aircraft nosecone and in a nacelle. Maximum capacity of the wing tanks is 755 gal., and auxiliary tanks can be mounted in the fuselage to bring the total to 845 gal. At normal gross weight, full wing tank load and fuel only tanks, the ferry range of the BD-7 is estimated at 3,820 mi.

Performance data have been based on flight test data from the XB-02, which have been continuing for about one year. They show a flight distance of 312 ft. over a 50-ft. altitude on a 1000-ft. climb. Time to climb to 25,000 ft. is 7.1 min.

At 25,000 ft., the cruise speed is 309 mph. Landing length even at 50 ft. is 490 ft.

On a hot day, the single engine takes off distance is 585 ft., over a 50-ft. climb.

Minimum rate of climb as set by regulation is 1,150 fpm, and the single engine ceiling is 25,000 ft.

Weights of the BD-7 design is 35.5 ft., over all length is 58.5 ft., and wing span is 49.0 ft. sq. ft.

USAF Contracts

Following is a list of unclassified contracts as released by U. S. Air Force contracting offices:

Manufacturing (at Herkimer, New York):
Contractor: Mass.—\$33,375 for the second of two contracts for the C-130 Hercules aircraft. The contract, for 100 aircraft, is an option on a previous contract.

Research (at Langley, Virginia):
Contractor: McDonnell Douglas—\$10,000 for research on partial differential equations.

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Contractor: McDonnell Douglas—\$10,000 for research on partial differential equations.

Systems (at Wright-Patterson Air Force Base, Ohio):
Contractor: Boeing—\$10,000 for development of the aircraft system.

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Systems (at Wright-Patterson Air Force Base, Ohio):
Contractor: Boeing—\$10,000 for development of the aircraft system.

PROBLEMATICAL RECREATIONS 142



Find 1000 consecutive telephone numbers.

—Continued

Our Guidance and Control Systems Division has electronic engineers with software experience to design digital computers for military aircraft. The job calls for original thinking which we ardently encourage. If you quickly and well to improve in the computer design area, a limited time would be to send your resume to Mr. Donald P. Keane.

ANSWER TO last week's question. Exactly 600 rods. It can be shown that in any general triangle the shorter line dividing it in two equal parts is equal to $\sqrt{2}(a-b)$ (a-b), where a is semi-perimeter, and a and b are the two longer sides. The fence will terminate at the two longer sides.

AN EQUAL OPPORTUNITY EMPLOYER
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Guidance and Control Systems Division
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Manpack Radio

Manpack radio, weighing 7 lb., including battery, provides private communication equipment to selected users, using spread spectrum technique. Known as RACF, jammer proof and noiseless (in extended performance), developed by Micro Ordnance Division. Manpack shows its point-to-point range of 2 mi. with radio sets in areas more than 10 mi. with larger sets.



The JetStar is small enough for low-cost operation and maintenance. Big enough to give a crew and 8 passengers stand-up room. Powered by 4 turbojets.

LOCKHEED JETSTAR the compact utility jet



CZECHOSLOVAKIAN MORAVA 200D recently built more than the production line at the National Aircraft Works in Kromeriz. Feeding a strength strain monocoque structure. Aircraft is certified under FAR Part 3 (Category N).

Aviation Week Pilot Report:

Morava 200D Has Rough Field Capability

By Robert J. Coleman

Since Czechoslovakia's mercantile flight laws, the Morava 200 series has been bedeviled by a desire to emphasize its use as an air taxi that can operate in rough fields in the Soviet Union and in emerging African colonies.

For a time, not long, during a period when the Czech aircraft industry is decimating work on business planes (AVW Oct. 15, p. 125), the Morava 200D, this aircraft's three-bladed propeller version, also is being pushed as a cost-cutting export item to win foreign currency for the nation.

Because of its success with Aeroflot, the Soviet airline, and CSA, the Czechoslovakian airline, the Morava 200, designer, Ladislav Švec, put it in considerable work on building a turboprop-powered version. However, in line with

the new policy, this project has been dropped as too expensive for an airplane which did not really fit the rugged open terrain notion.

The Morava 200D now is being planned into CSA as two schedules and about 27 will be arranged in the airline by the end of this year. They are operated on regular schedules, otherwise for short-haul charter flying, particularly on extensive air routes to countries that don't have air traffic signs in the Tatra Mountains, according to Petr Řehák, chief sales officer.

Švec, who does considerable scheduling work, and at present operational work on the Morava 200D fleet averaging about three hours per day, thinks plan to stretch the flight to its limit, since the two air routes mentioned in the area are a civil service that currently is not economically feasible.

As an example of the strained effort to make the two serve profitably, Řehák referred two Morava 200Ds at night-skiing airports during the annual Brno International Trade Fair, flying them on 15-min. loops in the immediate Brno area. Flight for the flight was about \$2 per passenger. On the last day alone, the surfaces made about 70 trips, averaging about four passengers per trip. Other airports mentioned are the Prague Blatná route in tandem with CSA's Dass 14, the Brno D-14 both under license, on both scheduled and charter routes.

The Morava 200D, flown by this Aviation Week pilot from the Brno Sport Flying Club, suffered about eight miles west of the industrial city, is a pilot's nightmare, says Řehák, and flying in about every flight time.

With CSA as two pilot Vladimír Vl.

ášek, the Morava 200D, registered as OK-RKA and later from CSA service for the flight, was tested at speeds up to 16 mph over rough, grassy land. Considerable care was taken to make sure it could be made at relatively high speeds without danger of dragging a wing or digging in a propeller.

Vl pointed out the main reason for the propeller change, a V-360 steel, three-bladed prop made by Avia, was to effect lift the fuselage higher off the ground for Soviet operators who find that others have 2.3 in. of ground clearance. The 200D was fitted with two-bladed Avia 6 H 3 in. propellers that failed in this type of landing car detent.

Propellers are driven by two Walter M-147 engines, a low-powered engine which accomodates low pressure after fuel injection before the inlet valves. Egonol, which produces 260 hp each, also includes a disengagable centrifugal supercharger.

Morava 200D cockpit can be entered from either side through wide doors, nor empennage uses three persons comfortably and interior on OK-RKA is both colorful and well-constructed.

Side visibility is excellent but forward visibility for pilots leaves something to be desired. Windshield is split by a broad rear wiper, though it is to be noted that rear wipers are used to try to滞留 large magneto oil coolers. However, this will not provide heating, though this side also obtains visibility. In addition, on this model, an aircar booster temperature gauge, a glass moisture device about 10 in. long, is affixed to outer glass on the cockpit's side.

A further cockpit complication for a pilot new to the airplane was the fact that instrument readings were in a mixture of Czech, French and German. Most Czech speak the latter language and French instrumentation has been greatly aided for documentation to others. Dual cockpit was a bilateral power control VHF radio.

Starting is simple since Morava designers have adopted the pushbutton technique wherever possible. Master switch and both magenta are pushbutton, as are start buttons for both engines. Start was accomplished by turning on master power by pushbutton and letting start button after start and ignition switch has been selected. Internal lantern power (24 v) was used for this flight, although provision has been made for external power units.

Passenger was engaged for starting and then disconnected when circuit current was 1000 amperes for safety. Magneto was checked at 2,200 rpm by depressing the magnetic button and searching for a 50 rpm maximum drop. Pitch control also is by pushbutton.

To facilitate the rough field mission,

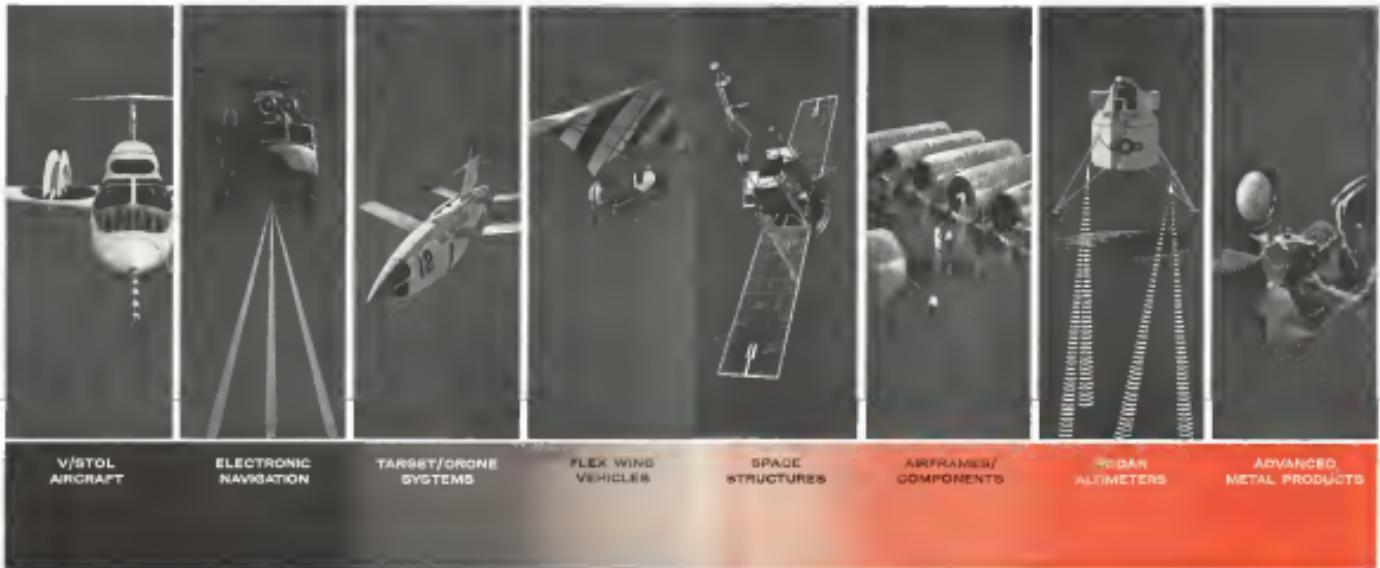


MORAVA 200D features a three-bladed propeller, is offered in four color combinations.



SOVIET UNION'S Aeroflot will take delivery on 10 200Ds for use as air taxi. Instrument panel, below, makes extensive use of pushbuttons. Note H-shaped Russian VHF radio.





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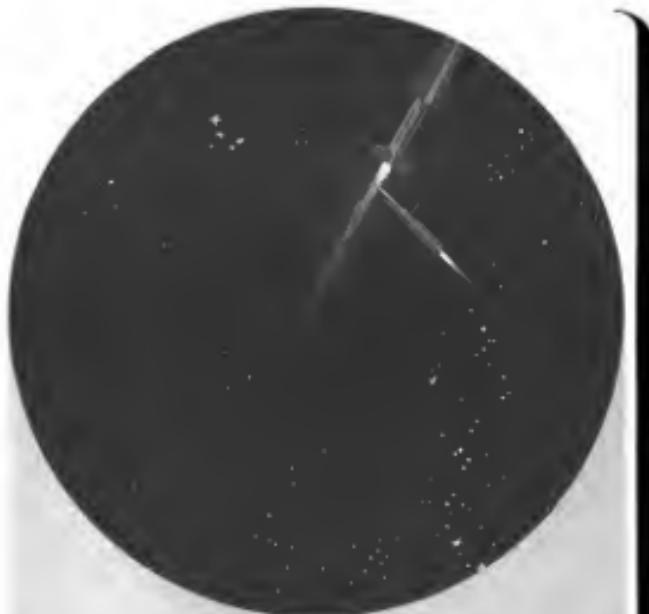
These notable breakthroughs by Ryan scientific-engineer teams, demonstrate proven capability to create the necessary technology and to manage every phase of new, complex systems.

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2 AEROSPACE TRACKING SYSTEMS

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3 MICROWAVE SYSTEMS

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5 AEROSPACE SUPPORT EQUIPMENT

Developing a wide range of test equipment, another Dalmo Victor specialty, Dalmo Victor supports the use of ground test equipment and ground environmental analysis. From a highly effective combination of facilities and talents, Dalmo Victor provides important aerospace responsiveness.

The page opposite describes one of the many Dalmo Victor achievements. Such data and experience in unusual utility are needed to further the art and other Dalmo Victor interests. If you would like to learn more in this program, write, telephone, and visit the many facilities of living in the San Francisco Bay Area. Please write, investigate a career with Dalmo Victor. It will be an unusual rewarding

□ An Equal Opportunity Employer □



MORAVA 200D equipped for air ambulance service contains two stretchers and a seat for flight attendant. C.R. Czechoslovakia, has a number of this type in operation. Baggage compartment is behind rear seat in passenger version.

Morava 200D's nosewheel is steerable from the center pedestal. Landing gear is hydraulically operated and a warning horn sounds if throttles are retarded with the gear in an extended position. Nose gear is strengthened through 360 deg and mainplane includes a shanty damper and light.

Flight Characteristics

On takeoff, flaps are set at 15 deg and retracted as engaged. At 100 ft/min, even for rough ground conditions, was about 250 mph and V₁ performed at under "one-one" conditions, mostly using the rudders for crosswind control. Climbout was about 600 ft/min at 90 mph.

Short landing was conducted near the city of Brno after this plane had been successfully modified away from the borders of the Brno military airfield. Home base for about 56 Morava 10 jet fighters assigned to Czechoslovak air force. Some appear to be in an air status but most probably are used for final training phase of Czech air force pilot trainees, now becoming a familiar sight in Czechoslovakia.

Morava 200D has very simple stall characteristics. In controlled "climb" configuration, gear and flaps down, the aircraft stalled at about 60 mph. Bleeding air and hydraulics, raising both controls, and then an almost straight-ahead lead. No aileron is used with gear and 10 deg of flap extended, with exception of a tendency for the Morava 200D to drop off slightly on the straightaway. Stall speed was about 55 mph.

Donga philosophy was to build as much strength as possible into

Morava 200D

Length	35.5 ft
Height	7.4 ft
Width	38.6 ft
Wing area	181 sq ft
Empty weight	2,310 lbs
Maximum gross weight	4,299 lbs
Power	1,410 hp
Wing loading	23.15 lbs/sq ft
Maximum level speed	300 mph
Cruise speed	185 mph

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KEystone of Industry

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Get all the facts about the many types of financing in Pennsylvania. Write for copy #1—Pennsylvania 100 Percent Location Services.

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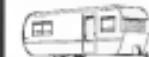
Petrochemicals



Office Equipment and Business Firms



Electronics



Mobile Homes and Trailers



Wood and Paper products

tug the aircraft to a speed of about 200 mph and then breaking sharply left at about 10 ft altitude. Gear was dropped at about 400 ft, and the airplane descended in a diving turn, with flaps lowered to 30 deg. for the final approach. Airplane touched down at about 80 mph on rough ground and VTL passed on the brakes. Landing roll was about 200 yards.

In a more routine landing, the pilot would be intent with speed lowered to 130 mph on downwind leg, gear lowered, and flaps lowered to the recommended 20 deg. for the final, continuing the final approach. Once again, little use of brakes, the landing roll was about 100 yards.

Mooney 2000 features twin engines, although twin-engine men have been kept small, partly to reduce the height of the aircraft for rough fields. Vertical tail surfaces are attached to horizontal stabilizer at points where they undergo most of the vibration.

All-Metal Wing

Trussoidal wing is all-aluminum and includes the slotted, constant extending flaps. When the maximum altitude fuel cells, not the tanks, are the wing's storage tanks, which total 32 gal. An additional 42 gal. is contained in the fuselage. Production control box is used for fuel transfer, and each engine can be fed from either tank.

Wing leading edge is double skinned and hot air is diverted from the engines for antiicing.

United Kingdom distributor for the Mooney 2000, Peter S. Clifford & Co., Ltd., has sold two airplanes to private owners in Britain. Export price of the aircraft, without complete radio package, is \$45,210.

Base price, however, includes full cockpit instrumentation.

Southwest Facility

Mr. Worthlessen's plan at \$210,000 is planned by Southwest Airlines Co. on a facility at Ft. Worth's Meacham Field.

Southwest Airlines' contract with the City of Ft. Worth calls for it to operate least \$83,000 in initial development, but the service company says it probably will spend closer to \$150,000 there in the first year of operation, including construction of a 100-ft. "hangar" and an underground fuel tank bank, in addition to a sales facility and purchase of fuel trucks and circuit ground service equipment.

Completion plans around the check-train were recently postponed after the Ft. Worth Field expansion and has cost \$10,000 apiece it is now for overall planning and follow-up. Non-exclusive fuel sales agreement has been negotiated with the city, which had Ruthlessen contacted this summer.



DELIVERIES WILL BEGIN in January of the new Mooney Master, improved version of the Mark 21, featuring fixed tricycle landing gear and simpler cabin furnishings, but otherwise identical to retractable-gear Mooney. Mark 20D Master landing gear is convertible so that owners may later have it modified to be retractable at cost of \$1,000. Master will list at \$13,995 as basic configuration.

Mooney Displays Two New 1963 Models

By Erwin J. Balkan

Kennel, Tex.—Mooney Aircraft, Inc., recently previewed its 1963 line of light aircraft and announced some cut-backs in its future expansion plans.

New aircraft to be shown the company's distributor-dealer organization here in coming weeks are:

• **Mark 20D Master.** For addition to the company model line, which since 1955 has consisted of one airplane, which has evolved into today's Mark 21. Although basically a modification of the Mark 21, the new Master is a Mooney attempt to broaden its sales by developing a more compact version for training, flying school and an aircraft for introducing inexperienced pilots to the line who feel that they are not yet ready for retractable landing gear. The Master is Mooney's answer to the Piper Cherokee and Beech Musketeer singleplace fixed-gear lightplanes.

• **Mark 21 400.** refined in detail, with price unchanged. Base list price will continue as the company's minimum. Mark 20D is the technically next designation for the formerly retractable tricycle-gear airplane which the company has termed the Mark 21 in its promotional and changeover to all-new lettering in 1961.

Mooney's plan for introducing its models to its field sales organization calls for three separate (though overlapping) dealer meetings. After these meetings, the company will be able to plan production schedules for the Mark 20D

student pilot and prospects at lower cost.

Customer selection, in the company's view, was to take the Mark 21, in the landing gear so that it was fixed and didn't distract attention much more. This also provided the firm an interesting possibility—that of providing a modification kit so that a Master owner could later have the airplane



DUAL CONTROLS are standard on new Master, which also features amplified instrument panel. Interior furnishings also are more modest than Mark 21 to keep price down.

INQUIRIES MAY BE ADDRESSED TO:

PENNSYLVANIA DEPARTMENT OF COMMERCE
Thomas J. Monaghan, Secretary
Room 925, South Office Building • Harrisburg, Pennsylvania
Phone 717-384-2002





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Hughes Aerospace Division
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Please promise you a reply within one week.



SAFETY

Blast Caused Continental B-707 Crash

On the night of May 22, 1962, a Convair Air Lines Boeing 707-124 (N 7071), operating Flight 1101 en route from Chicago to Los Angeles, crashed into the Pacific Ocean off the coast of San Francisco, California. The aircraft, via an IFR route, was at an altitude of 39,000 ft. A few minutes after flight 1101 had made a number of descents from cruise to emergency altitude, the aircraft, which had been flying in the right wing of the aircraft disappeared from the scope of the 080° visual line flight following radar. At approximately 2115, as indicated on the flight record, the aircraft was in a steep climb of 100 ft per second from the last sighting. The aircraft then passed the 10,000 ft level and then the 20,000 ft level, the aircraft then passed the 30,000 ft level, and finally the 39,000 ft level. The aircraft then disappeared from the radar scope. The aircraft was not totally destroyed.

The Board determined that the probable cause of the accident was the disengaging force of a dynamic explosion which occurred on the right rear tire, resulting in destruction of the aircraft.

Investigation

Airmail N 10775 • Boeing 307 124 - arrived at Chicago International Airport, Chicago, Illinois, from Los Angeles, Calif., at Continental Air Lines Flight 10 at approximately 1900 on May 22, 1962. At O'Hare the aircraft received routine servicing and a transponder injection or programming for scheduled departure in Los Angeles via Flight

11 with an intermediate stop at Kansas City. The crew of Flight 14 had been enroute to CM-11474-4, "The Last Flight," of Capt. Fred R. Gray, First Officer Edward J. Sullivan, Second Officer Roger D. Atiles, Director of Maintenance David T. O'Brien, and Captains' Flight Engineers Martin McGrath, Martin Rydel, and Steve Berry. Flight duration was accomplished in the daylight at the center's Intake/Intake in Denver through the continuous service aircraft to the center in Colorado with one stop and planned fueling.

The planned flight path, covering a distance of 29,265 ft from Chicago to Kansas City, was changed to 18,000 ft by the captain because he had to land at Cheyenne, Wyoming, to wait for a flight to Cleburne, Texas. The flight from Cheyenne to Kansas City was delayed on the return flight. Flight 14 was released from O'Hare with a reduced gross weight and a center of gravity well within prescribed limits.

U.S. Weather Service forecast indicated thunderstorms activity associated with an active cold front and scattered spell lines between Chicago and Kansas City. A severe weather warning was in effect for an area which in areas part of the proposed route of Flight 11, predicting heavy thunderstorms maximum tops of 15,000 ft with

Power to estimate incidence and prevalence
of diseases

Flight 110 reported at O'Hare Airport at 1615 and was vectored by approach control to a holding point, 17, awaiting over head clearance. At 1700 hr on Jet Route 26, Vireo at 17,000 ft, just east of the Wisconsin River, it was approximately 1111. Flight 110 asked clearance to descend to 10,000 ft and a request for the south line and end of the flight. The approach controller cleared the center holding the flight west to the right following Radar Site at Waukesha, and 10,000 ft, one minute later. At about 2700, Flight 110 requested information regarding the location of the storm and the Waukesha controller suggested a surface-to-surface investigation of a thunderstorm lying across the general flightpath.

Additional discussion between Flight 11 and the controller developed the fact that the thunderstorms could be circumnavigated either to the south or to the north. The outcome of this discussion indicated that the convective radar was operating satisfactorily and Flight 11 elected to fly to the north around the storm cell. After the aircraft had turned around the storm, the controller informed this flight that a direct route to

Wright knew his present position should not be permanent. He soon realized that they were starting a tour and suggested returning direct to Kansas City. Wright contacted appeared the next day and informed the flight that decent weather was being predicted.

for several months. Wainwright attempted contact with Kauai City Center without success. On January 12, 1970, while flying alone in a Cessna 172, N1035W, at high altitude over the Pacific Ocean, he was approximately 10 miles offshore when he saw some lights "so far down to the west" as to make him wonder "if this was the first transonic flight." He was flying at 10,000 feet, and believed the lights were from a transonic aircraft. At 11:44, he was attempting to make a radio contact with the University of Hawaii, when he heard another transonic aircraft. Wainwright established contact with Kauai City Center and attempted to set a radar homing of Flight 11. He was unable to do so, and was unable to make contact with the University of Hawaii. Wainwright then attempted to contact Kauai City Center again, and was able to set a radar homing of Flight 11, then, about 10 miles offshore. The transonic aircraft was identified as Pan American flight 11, a Boeing 747-100, N100PA, flying at 10,000 feet, and moving in a westward direction. The Kauai City Center controller informed



C-133 Undergoes Pressurization Test

Douglas C-130 is assessed as a feasibility test bed for performance cycling during several USAF fatigue research programs. Aircraft usually completed the equivalent of 10,000 hr, flying time, during which the aircraft underwent 12,000 transited flights. Tests were conducted at Douglas Aircraft Co's Long Beach, Calif., facility. Only minor cracks in the skin, all repairable, developed during the test period which resulted in pressurized air leakages, fuel leakages, and gear loadings on landing wings, empennage and landing gear. All were easily repaired. The test in 40,000 simulated hours.

lastly observed an indicator target at the approximate position but that target did not appear to be over the water. The indicator and target were visible for most landfall purposes.

After referring to his navigation log, he estimated the flight to have occurred at 2100, near the location where the last radio target of flight 11 had been seen by Wren's brother. The brother stated that weather in the area at the time was clear with little or no turbulence.

Flight Recorder

The flight recorder recovered from N 70275's right magazine showed little data, but there was extensive detailing of the remainder radio, sensor, data and the aircraft's position and attitude. The aircraft attitude never indicated a normal descent, from 70,000 feet, was begun at approximately 2115 in the area where the aircraft became inoperable. The aircraft attitude never indicated a normal descent, from 70,000 feet, was begun at approximately 2115 and it continued at a flight constant rate of 3,000 ft per minute for 2 min. This was an altitude of 36,000 ft. The aircraft attitude never indicated a normal descent, from 70,000 feet, was begun at approximately 2115 and it continued at a flight constant rate of 3,000 ft per minute for 2 min. This was an altitude of 36,000 ft. The aircraft attitude never indicated a normal descent, from 70,000 feet, was begun at approximately 2115 and it continued at a flight constant rate of 3,000 ft per minute for 2 min. This was an altitude of 36,000 ft. An emergency checklist was issued between the captain's role and his instrument panel. The right deck checklist stopped at 2120 14 and 2121 45, respectively.

The wreckage of N 70275, minus the aft 10 ft, and with part of the left and most of the right wing intact, struck the ground, headed westerly about a 30-deg slope of in-

terior or 26,000 ft. The aircraft commander later reported that he saw a bright light to his right and that he turned to the right and saw some smoke for most landfall purposes.

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Four large pieces of the aircraft were scattered in a northerly direction above the aircraft wreckage 4 to 8 km from the main wreckage. One of these, a 20 ft section of the left wing, was found about 4 km from the main wreckage.

The outboard panel and tip of the right wing, the remaining fuselage, the right deck checklist, and the right deck checklist were scattered in a southerly direction and with the intent not about 100 ft. There were indications of rotation about the vertical axis at impact but the absence of ship scale made the full reflected air about complete lack of rotation. The right deck checklist was found close and broken, the right flap was up. An emergency checklist was issued between the captain's role and his instrument panel. The right deck checklist stopped at 2120 14 and 2121 45, respectively.

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terior or 26,000 ft. The aircraft commander later reported that he saw a bright light to his right and that he turned to the right and saw some smoke for most landfall purposes.

The wreckage of the aircraft showed extensive damage to the main wreckage. Large debris materials such as paper, insulation, pilots, and insulation were recovered at distances up to 120 m away.

Examination of the wreckage showed no evidence of any damage to the aircraft from below or underneath, fire or flight or collision with another aircraft or foreign object. The condition and manner in which the wreckage was found indicated a high altitude breakup and disintegration of the aircraft in flight.

During the initial stages of the investigation about 20 ft of 1/4" diameter between stations 1220 and 1400 could not be found. An extensive search for the missing wreckage was conducted, all scattered wreckage, including pieces of the main wreckage, the right deck checklist, and two segments of the left fuselage, was later recovered. One segment of the fuselage, or section about 10 ft forward of the main entrance door to the passengers, the right deck checklist, the interior in the main cockpit area.

As interior and exterior parts of the fuselage were collected from the main wreckage it was found that



Helicopter crew are rescue equipment, developed by Kaman Aircraft under a 1195000 Navy contract, successfully makes a simulated rescue at night or moderately heavy sea about five miles off Block Island, N. Y. Wren was shot free fast as helicopter moved in toward fast subject. Kaman engineer in water impossible to rescue and unable to help himself. Above, left, is pilot's view of subject in landing lights. Right, pilot using ladle net set out an invisible area.

Ladle Net Helicopter Rescue Gear Scoops Immobile

Engineers at Kaman Aircraft have developed a device that can be lowered from the helicopter, then lifted out of water. Divers have been used for a number of the approximately 15 open sea rescue trials made to date, but it was found that less subjects tended to make an effort to use the divers. Navy engineers have developed a device that can scoop unconscious or immobile persons from the water. The device is pictured here. Sequence is composed of photo taken during two different occasions.



Cable, threaded through end of net, lowers net to water level. Net in some use is strained. Navy engine net, but effective area has been increased about 50% by use of ladle handle. Ladle swing forward to pilot can see both person in water and net at all times. Flying Navy HU26L dip net before the net is cast and comes forward until the net is below the person to be rescued. Then the pilot immerses the helicopter's sheath. Hydrodynamic forces bring the net into use away from the net.



Test Subject From Running Sea During Darkness

Cable, threaded through end of net, lowers net to water level. Net in some use is strained. Navy engine net, but effective area has been increased about 50% by use of ladle handle. Ladle swing forward to pilot can see both person in water and net at all times. Flying Navy HU26L dip net before the net is cast and comes forward until the net is below the person to be rescued. Then the pilot immerses the helicopter's sheath. Hydrodynamic forces bring the net into use away from the net.



When you follow these welding instructions— you can perform wonders with "T-1" Steels

USS "T-1" Steel, and "T-1" type A, are two of the most versatile steels ever developed. They combine very high yield strength (100,000 psi minimum), outstanding toughness, and ready weldability. Developers have taken advantage of this remarkable combination of properties to build stronger, lighter structures of many types, and to improve the performance of an impressive array of heavy-duty equipment.

Achieving great strength and toughness in a steel is not an automatic result. But by following these guidelines with welding as in the case of USS "T-1" and "T-1" type A Steels, it is this weldability that permits the designer to take full advantage of the strength of "T-1" Steels.

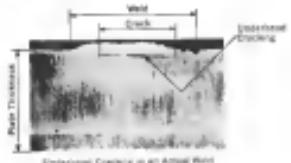
Using heat-treated constructional alloy steels, USS "T-1" Steels require different welding techniques than other high strength steels. They are not difficult to weld, just different. Strong, reliable joints are obtained when the following three precautions are followed. We invite you to read them as a guide to realizing the full benefits of USS "T-1" Steels. They are detailed in a booklet which includes a Welding Heat-Input Calculator, and in our new welder training film, "How to Weld USS "T-1" Steels" (see coupon).

RULE 1—Use the proper electrodes

When manual arc welding "T-1" Steels, use only electrodes with low hydrogen content. Do not use welding methods which can "overheat" them, such as inert-gas shielded arc or plasma arc welding.

Hydrogen is the number one enemy of sound welds in "T-1" Steels, as in all alloy steels, because it causes undercutting, cracking, and unreliable joints.

To be sure you have selected the correct electrodes, remember that low hydrogen content are designated by the last two numbers of the electrode classification as 15, 16 or 36. Note other, for example, E6015, E6016, and E12035 are satisfactory for welding USS "T-1" Steels.



When you want to be positive that the finished weld will be strong as the parent "T-1" Steel, use E12035, -16, or -36 rods.

Never use electrodes or wire flux combinations containing vanadium to weld "T-1" Steels if the weldment is to be stress relieved. Weld metal containing vanadium is likely to be made brittle by stress relief (stress relief is only necessary with "T-1" Steels when re-

quired by codes and on or two other special cases.) When welding "T-1" Steels to a lower strength steel, use low-hydrogen rods of the strength level recommended for the lower strength steel.

Proper handling of electrodes is also important. When exposed to air, low-hydrogen content will pick up moisture which is a rich source of hydrogen. Keep your electrode as dry as possible. Make sure the moisture content is 80 percent or less. If rods are stored in a 250°F oven, even if your rods have absorbed moisture, let them stand in an oven according to the manufacturer's recommendation. One hour at 250°F is enough.

To sum up Rule 1, for manual welding use low-hydrogen electrodes and keep them dry. For submerged arc or inert-gas shielding arc welding, use thoroughly dry fluxes and water-free shielding gases.

RULE 2—Use correct welding heat

On most kinds of structural steels, high heat input results in superior welds. With "T-1" Steels, just the opposite is true. The best welds in "T-1" Steels depend on never getting over a certain maximum amount of heat. Less heat is used so the weld will cool quickly when, in "T-1" Steels, results in good, tough welds. Thus, you must closely monitor the amount of heat put into the weld.

For this reason, never preheat "T-1" Steels except in special cases (preheating means more heat to get rid of a longer cooling off period, which can be harmful to welds in "T-1" Steels). The cause in which preheating is necessary is when the welder must use a welding technique which requires an excess of heat (hydrogen source), where the steel is so restrained it doesn't have room to shrink after welding, or when thick plates over 1" are being welded. Much of the time, however, preheating isn't necessary, and never preheat "T-1" Steels on sheet steels.

The heat you put into a weld depends principally on amperage and the speed at which the arc travels along the joint. The higher the amperage, the more heat input. The slower the speed, the higher the heat input. Controlling the input requires keeping amperage below certain limits and keeping the speed of travel above certain speeds.

There are two other important rules to keep track of sheet thickness and temperature. Thicker sections can safely soak up more heat than thinner ones, so you can use more amps and slower speed. As for thinner, the section may have been heated up by preheating or by previous passes of the electrode. So if the section is already hot you must cut down on amps or increase speed to avoid excessive heat input.

Heat input calculator.

There's an easy way to determine the safe heat input for your "T-1" Steel. The circular Heat Input Calculator which is provided with the book offered in the coupon. With it you can quickly find out what amount of heat will result from any given setup, and determine how much more you can safely put in. It is a



simple "slide rule" which tells, on the front side, how much heat will be put into the joint if you know the amperage, voltage, and arc speed. On the back side of the calculator are tables showing the safe heat inputs for "T-1" Steels in several different thicknesses at different temperatures. This handy device is designed to help you get good welds every time. Heat inputs may also be calculated from this formula:

Heat Input per Inch =

Amperes x Arc Volts x 0.03 Weld Length (feet)
Square inches per min. — Per Inch of weld

RULE 3—Use recommended welding procedure

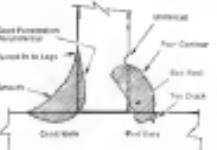
The straightforward straight-bead method is preferred for welding "T-1" Steels. Do not use the "J" weld" or "W" weld. Welding these methods more because the "J" and "W" welds are more likely to cause excessive heat input. The proper method is to fit the groove with a succession of ever-greater beads.

Before a bead can be laid over an earlier bead, the flux scale, or oxidants must be removed.

Back gauging. The preferred method is arc air gauging. Avoid arc blow by air gauging. Do not use an oxygen-acetylene torch. There is danger of overheating which may result in an unsatisfactory joint.

Spend. Whether you control speed by machine or hand, control it closely. The Heat Input Calculator described above in your guide to welding with "T-1" Steels, spend time on it. It is the key to good welding.

Fillet welding. Good fillet welding technique is more important with "T-1" Steels because the joints are usually required to withstand greater stresses. Thick sections, for example, are more difficult to weld, and the electrodes, which can become hard and brittle, can not be easily melted and will travel as far to the legs of the joints to be joined. The layers of each weld should be made so that there is good root penetration but no undercutting. The weld shown on the left is ideal, the one on the right is to be avoided.



When thick plates are joined, and when the weldment is to be stress relieved, fillet welds can be trouble-prone because of hot cracking. There are several

ways to eliminate hot cracking near fillet welds on "T-1" Steels. In the case of T-1 or E11 joints where lower strength welds are often the rule, use low-hydrogen rods of the E60, E60, and E70 classes. Being lower in strength and more ductile, they are less likely to "break" or crack at the top of the weld.

Another way of preventing the weld from cracking is to use a "butter" weld. This "butter" weld strengthens the "T-1" Steel in the area where a hot crack may start. It is ground off prior to actual fillet welding and must be located so that the toe passes of the fillet will be laid right over the strengthened zone.

Other methods that can prevent cracking include use of a soft-wire prepass, machine grooving the base of the uprights, and laying down "butter" welds on top of the fillet. The first two methods are often helpful in preventing cracking, especially if the weld is to be stress relieved. Joints made even with the thicker strength rods (E100, E110, and E120) should be free from hot cracks if possible. Sometimes it is necessary to preheat each pass; at other times, preheat only the toe passes will prevent cracking. After preheating, the joints should be smoothly ground to fair the fillets into the legs of the joint.

Free Welding Help. The above information is spelled out in greater detail in our free book "How to Weld USS "T-1" and "T-1" type A Steels." To obtain a copy, send a self-addressed envelope with a stamp to "Welding Help." The book contains complete welding instructions, welding charts, and a 16-page color motion picture of the same name to help you in understanding how to weld "T-1" Steels. Send to: United States Steel, 1200 Dearborn Street, Chicago, Illinois 60601. United States Steel Company • Canadian-Sabres Steel Division • United States Steel Supply Division • United States Steel Export Company.



United States Steel

United States Steel, Room 6001
828 William Penn Place
Pittsburgh 30 Pa.

General:

- Please send me _____ copies of "How to Weld USS "T-1" Steels."
- Also send me _____ copies of "Welding Help."
- I understand there is no obligation.

Name: _____

Title: _____

Company: _____

Address: _____

City: _____

Zone: _____ State: _____



This much information is provided
in trade of credits, deductible Steel

LETTERS

Homer Nods . . .

Subject: Professional Recognition #115
Revised and a personal message to S
M. Homer, Bell Helicopter Co., Fort
Worth, Tex. (Letters, Oct. 15, 1962).

My congratulations to S. M. Homer of
Fort Worth and to all other members of
Published Responses who have
submitted their letters to *Aerospace* #115.

As to the requirements of the problem, do
you know that *Aerospace* #115
has about 494,200 different answers
at the requestors of the problem. So
does 999,997. We know about 600. We
should have published both. We stand by
our nod.

In the words of Silence, " . . . even the
greatest masters make mistakes. Read
them often, follow them closely. They
will teach you very well."

ANSWER: DODDS
Cope Research Division
Letter Industries, Inc.
Santa Clara, Calif.

... And Nods

Your note of Oct. 15 (#115) has an
answer to the Professional Recognition No.
150 of Letter Industries, Inc., advertising in
the Oct. 1 issue (#115) the dimensions of
two rods which answer the puzzle. It might
interest you to know that they are not
one of the sets of right-angled triangles
which are the answers to the problem, but
that are not primitive, or incongruent.

Given a right triangle with sides x and y
and hypotenuse z where the area A is equal
to $xy/2$ and the perimeter P is equal to
 $x + y + z$, it is possible to expand P
to a sum of three terms which after some
series of solutions for the roles x , y and z
as follows:

$$\text{But define } x = m + n\sqrt{-1}$$

then, A can be shown that $x = m + \sqrt{-1}z$
($m = \pm 1$ or ± 2) and $y = n + z$. The
following table shows the first seven sets
of real dimensions in this sense:

m	n	x	y	A	P
0	0	1	0	0	1
1	2	3	13	13	17
-1	1	4	16	32	21
2	4	16	33	52	53
-2	4	20	41	41	53
3	4	24	45	54	74
-3	4	26	56	56	88
4	4	32	65	64	97

JAMES L. TAKAHASHI
Special Projects Department
Rutherford Co.
Meadow and Space Divisions
Bell Labs, Murray Hill.

Doppler Comment

It is not difficult to understand why
scores of engineers have given up the
Airbus Navigation Arm in their design
with PWA over the use of Doppler radar
in a general navigation system. We have
selected the most one of doing the one of
the infrared frames who are doing the

selected by automatic equipment. Naturally,
the infrared is not a Doppler system, but
using the infrared to the ANA to determine
the other criteria of the Doppler radar
is misleading.

The big squib is apparently concerned
with the cosine deviation among four or
more independent magnetic north. A Doppler
radar can only measure the speed of a
fixed base or mobile source because it does
not itself generate such a signal. Obviously,
that signal is supplied by a magnetic compass,
and when the signal is used will produce
errors in the navigation system unless these
errors are removed. The Doppler radar
does not have the ability to do this. The ANA
does is comparable to blinding a computer
by giving answers when the input data is
incorrect.

It is interesting also to note that the other
contributors to the ANA is concerned
with the LORAN system. I am not sure
why he and the Doppler system itself
if the ANA (and Ray Electronics) want to
point the quivering loop, to this point
at magnetized magnetic data and, well,
LORAN again rather than Doppler radar.
It is a pity that their contributions to the
rest of the problem will be overlooked. In
the very drug that ANA wants to avoid
the elevation of their American dragoons!

PAUL B. GASKINS
Advanced Systems Electronics Division
Rome Air Materiel Command
Rome, Ga.

Pilot Criticism

Due to deteriorating working conditions
with the advent of the big commercial jets
I found that just after 8 a.m. as an American
Airlines captain any extra minute of leisure
is to sit in an auxiliary position is a
luxury.

The airline captain discussed at the
professional airline pilots during the car
and stewardess-pilot flight engineer meetings
has informed me and I emphasize the travel
and the stewardess, as well as M. H. Haskins and his
F.A.A. committee, that the following is to
make the following statement:

• In my five years I have witnessed a single
jet by my flying captain that I wish I had not
been assigned to. He could turn a profit
with a single flight.

• I have observed a stewardess at another
supposedly private point at the control of
a commercial airline without complete con-
trol by the autopilot and further commented
to the autopilot and further commented
to the flying captain.

• After many hours of solid performance
of the stewardess, the stewardess and the
stewardess, I have on one occasion observed a pilot
else has been incommunicado or because
through approach pilot etc., to lessen the
strain of maintaining continuing
activity while the stewardess was occupied
with the stewardess, and the other stewardess
of the stewardess, as observed in a cockpit engine,
stewardess, as well as stewardess person possess-
ing a top rating, should be given widespread
publicity to the stewardess public by
completely incorporating the existing
fact.

In conclusion, as long as a pilot per-

sonal of any type are permitted on the
airline, the stewardess should be considered
as confidential reports of the stewardess by
those who cannot be expected to understand
an airline pilot's series.

JAMES H. HASKINS
Captain, USAF
McKee, Cheyenne Point, N. C.

Dollar A Day

At the time of *Globe* there was around
the world I intended to write you but the
point of business detained me. Now with
Solvay's permission, I want to comment
on the following statement made by the
Editor of *Aerospace* (Letters, Oct. 15, 1962).
The Editor states that "the cost of the
ANR does is comparable to blinding a computer
by giving answers when the input data is
incorrect."

That thought was true. Every time we
used it from the 1948 version going
through the 1952 version, the cost of the
ANR was to be great and the cost of the
computer, initially decided everyone for
one day's substance. It was kept on going
until the world understood the service, but it
was not until the 1954 version that the
cost of the ANR was to be great. The
Computer Company of America, however,

retained the passed sheet, unfortunately.

In view of the precedents established,
as described above, would it not be appropriate
to call the Computer Company's
attention to the fact that the cost of the
computer, initially decided everyone for
one day's substance, should be modified
in three and six days additional
substance respectively? Should these not
be a general decision on the part of the
Computer Company of America for the
next 5 days—if this is questionable? What do you
think?

M. B. GRANER, Manager
Rutherford Co.
Western Region Office
Hartford, Conn.

Engineer Overage

The little gem of a poem by an engineer's
wife in the Oct. 1 issue of *Aerospace* (#115)
regarding the engineer's wife to apply
certain engineering effort was not just
good to write, it was good to read.

My husband who has an M. S. in M. E.
has worked at Clifton Precision for six years
in various aspects of design operations. The
inside engineers are eager to have him
work in the field of design operations, but
he is finding it very difficult to get a
job in the field. Why, I thought, thought
NASA, et al., were giving the engineers in
order to get on with the job for the mean
man. And our only job NASA did not want
was that of the mean man. And that is the
problem. The mean man is not the right
kind of engineer. The mean man is not the
right kind of engineer.

For those companies to all say that they
can't find a job and then get a graduate from
NASA.

(Name withheld by request)

ESTHER WINE
Danville, Fla.



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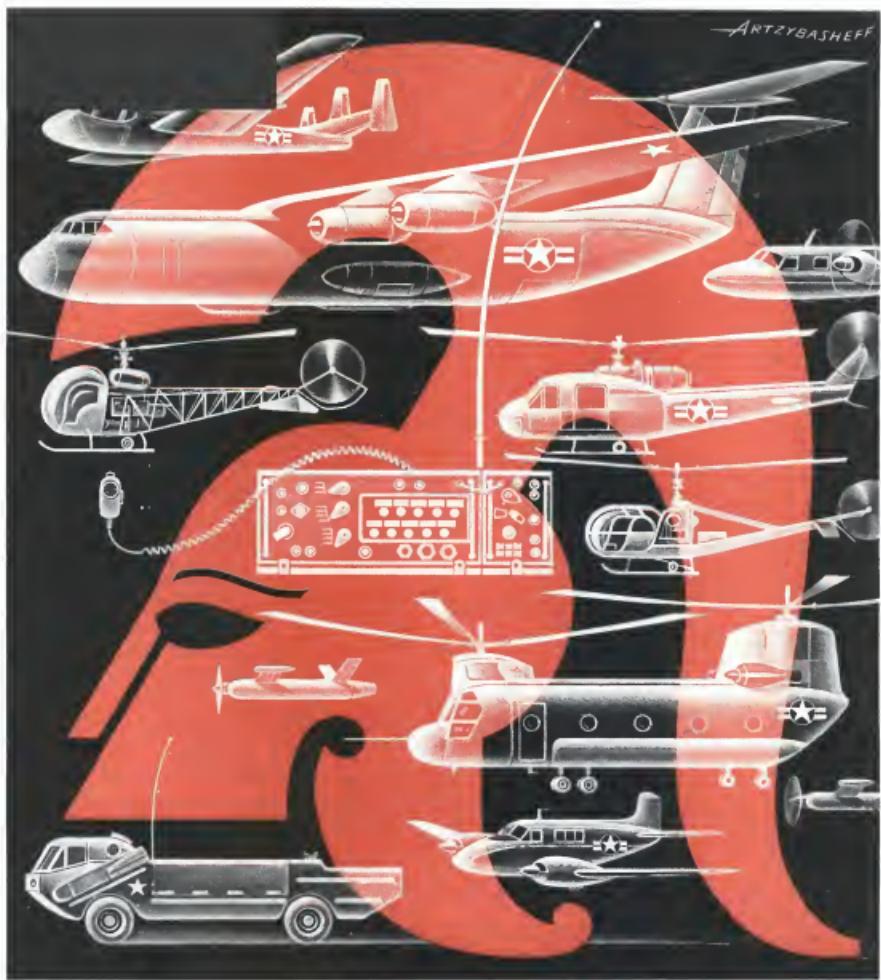
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